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ECONOMIC GEOGRAPHY

JANUARY

INDUSTRIAL CHINA
H. F. James, *Economic Geographer, Wharton School of Finance and Commerce*

LAND RESOURCE INVENTORY IN MICHIGAN
Carleton P. Barnes, *Forest Mapper, Michigan Land Economic Survey*

AGRICULTURAL REGIONS OF NORTH AMERICA
Oliver E. Baker, *Senior Agricultural Economist, U. S. Department of Agriculture*

SCRANTON'S INDUSTRIAL INTEGRITY
Clifford M. Zierer, *Economic Geographer, University of California at Los Angeles*

A CRITICAL SITUATION IN TWO ONE-CROP WHEAT FARMING DISTRICTS IN CALIFORNIA
John Wesley Coulter, *Lecturer in Geography, University of Hawaii*

CLARK UNIVERSITY, WORCESTER, MASSACHUSETTS, U.S.A.

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THE FUTURE OF CHINA

THROUGHOUT her history China has been dominantly an agricultural country. Most of her millions of people have subsisted by agriculture, and her whole economic structure has been built up on that industry. Her great areas of best lands have been intensively tilled and densely populated; her vastly greater areas of submarginal lands have been unoccupied, for lack of power, machinery, and capital have confined her farmers to the fertile lands where by hoe and spade and human labor they could gain a living from the few acres they could till by their primitive methods. The pressure of population has been mercilessly heavy upon the restricted areas of productive land.

A new day is dawning in Chinese agriculture. Modern methods are supplanting the old primitive system, capital is slowly but surely becoming available, and power and machinery are being introduced. More than two million farmers have moved from the densely populated districts about Shantung and Peking onto the drier lands of Manchuria and eastern Mongolia within the last few years, there to take up successful dry farming occupation of the land. By so doing they have relieved the population pressure upon the lands whence they came.

Simultaneously the development of machine industry in the cities along the coast, the rivers, and the railways is going on apace and millions more of the dense farm population are being employed in the shops and factories, thus further relieving the congestion. How far this industrialization can proceed is an open question, for China's available supplies of those two basic commodities so essential to great industry, coal and iron, seem inadequate to sustain such colossal industrial activities as flourish in eastern United States and western Europe.

The new developments in China promise a happier future for her great people. The expansion of agriculture, and the utilization of her manufacturing resources in great industries, will surely raise her standards of living, and stabilize her economic and political life. China is assured of a powerful influence in the world's affairs, without any menace to the world's peace or security.

ECONOMIC GEOGRAPHY

VOL. 5 JANUARY, 1929 No. 1

INDUSTRIAL CHINA[1]

H. P. James

Economic Geographer, Wharton School of Finance and Commerce

CHINA probably has more people engaged in manufacturing than the United States. Millions of her inhabitants play a dual rôle in the economic development of the country. The farmer's home is at times his workshop, where all the members of the family are employed, even the farmer himself, when work is impossible on the land. In the Chinese cities are also many shops, the products of which are manufactured, as well as sold, within the confines of the establishment. Living in the midst of an advanced industrial era, we frequently overlook the importance of home industries in the economic development of oriental countries. Many articles of importance in Chinese foreign trade, such as pottery, umbrellas, hair nets, laces, mats and matting, straw braid, grass cloth, and chinaware are largely of home or workshop manufacture.

China is not, however, a manufacturing nation of the modern type. In reality she has just begun her Industrial Revolution for the modern period dates back only to the year 1890, when the Viceroy Chang Chih Tung shook the ancient Chinese world by establishing a modern spinning plant at Wuchang and an iron works at Hanyang near Hankow on the Yangtze Kiang. It was not until 1895 that foreigners were granted the right to operate mills in China. Under the Treaty of Shimonoski,[2] that ended the Sino Japanese War, foreigners were allowed to engage in manufacturing and to import the necessary machinery, providing that they confine themselves to the treaty ports. The lack of modern industrial development in China is clearly

Items		*China*	*United States*
Area	Square Miles	4,282,000	3,743,500
Railways	Miles	7,000	250,000
Surfaced Roads	" (Estimated)	5,000	500,000
Graded Roads	" (Estimated)	10,000	1,000,000
Telegraph Wires	"	84,000	1,850,000
Telephones	Number	100,000	17,000,000
Motor Vehicles	"	22,000	22,000,000
Post Offices	"	11,000	51,000
Coal Output (Annual)	Tons	25,000,000	585,000,000
Hydro-Electric Power	Kilowatt Hours	Nil	17,000,000,000
Yearly Capacity of Blast Furnaces	Tons	500,000	45,000,000
Pig Iron Output	"	300,000	27,000,000
Cotton Spindles	Number	3,500,000	37,000,000
Cotton Looms	"	25,500	650,000
Wheat Flour	Barrels (Estimated)	30,000,000	115,000,000
Laborers in Modern Industrial Plants	Number	500,000	7,000,000

[1] The word *industrial* as used in this paper is given the same meaning as manufacturing. The author in the preparation of this article has used extensively the material found in that most excellent book, *China—A Commercial and Industrial Handbook*, Julian Arnold, U. S. Bureau of Foreign and Domestic Commerce.

[2] *Chinese Year Book*, 1924.

indicated in the following comparative statistics. [3]

An examination of the growth and development of China reveals many reasons why she should have been farther advanced in her industrial development. She is larger in area than the United States, with a population at least three times as large. Her 400,000,000 people and her area of 4,282,000 square miles, if numbers

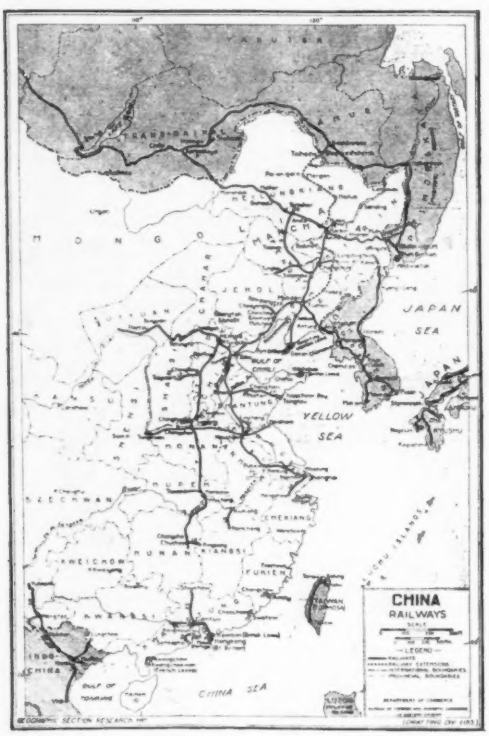

FIGURE 1.—The railway net of China is confined in large part to the coastal areas bordering on the Yellow Sea, a region of dense population, of increasing industrial activity, and of greatest progress in western civilization.

are any criterion, give her major rank among the countries of the world. Her start as a nation has been one of the earliest for she was contemporary with Babylon, Ninevah, Greece, Rome, and Venice. Her people lived in houses and wore raiments of silk when our ancestors roamed the forests of Europe as naked savages. In fact, Chinese authentic history begins about 800 B.C.[4] At the time of Christ, the Chinese were showing themselves to be people of remarkable originality and ability. Their political condition was not unlike that of the German confederation in the eighteenth century. Their ability to plan great engineering and flood control works was in evidence as early as 200 B.C., when the Han dynasty engineers constructed the Chengtu system, the general plan of which is still being utilized on the Chengtu plain of west China.[5] They have also given to the world gunpowder, the compass, the use of silk and printing from carved blocks. They developed a knowledge of the utilization of boats and it is said that today China possesses a greater number of boats than any other country. Their engineering skill has been demonstrated of high grade by their building of the Great Wall and the Grand Canal.

Along with these signs of constructive ability, the Chinese possessed a country that was fairly rich in natural wealth. Like our own forefathers, they had to conquer a country of continental proportions. The Tsingling Mountains, forest-covered and formidable, confined them for a long period to the fertile lands of the Wei River and the open loess country of Shensi, as likewise the Appalachians confined the early Americans to the Atlantic seaboard. Beyond the mountains was the Yangtze Valley, the present heart of China, forest-

[3] *U. S. Commerce Reports*, Nov. 28, 1927.

[4] Little, Archibald, *Chinese Year Book*, 1925, p. 41.

[5] Hubbard, George D.; "The Geographic Setting of Chengtu," *Bulletin of the Geographical Society of Philadelphia*, Vol. 21, No. 4, October, p. 109. (An excellent treatise describing conditions in one of the largest and most important inland cities of Central West China.)

covered and sparsely populated, and still farther removed was South China, the present home of teeming millions. It is estimated that 29 per cent [6] of the total land area is available for the production of crops or approximately 700,000,000 acres, an area almost five times greater than the total area of continental France.

Her climate is varied as is befitting her range of latitude and longitude. Although her northern areas are frequently subject to insufficient rainfall and her western lands are arid or semi-arid, her central and southern sections have ample rainfall with a growing season of such length that more than two successive crops per year are possible. Even in North China where the average annual rainfall is only 21 inches, 70 per cent of it falls in the three months of June, July, and August. It is a land where the rain comes at the most propitious time, the time of greatest heating, and is brought by the same monsoon that made India possible as the home of millions of people.

In her mountains and plateaus nature has deposited greater mineral resources than in any other Far Eastern land. They are as yet practically untouched. Known resources of coal are estimated today to be in the neighborhood of 40,000,000,000 to 50,000,000,000 tons.[7] Some authorities estimate her coal resources at nearly one-fourth of the world's supply. Her iron reserves are placed at 950,000,000 tons or approximately one-fifth of the reserves of iron ore of present commercial grade in the United States. Over 100,000,000 tons [8] of this reserve are of such high

FIGURE 2.—Making the famous Chefoo lace. Living in the midst of an advanced industrial era, we frequently overlook the importance of home industries in the economic development of oriental countries. Lace making is one of the most typical of Chinese cottage industries. (Courtesy of Presbyterian Foreign Missions.)

[6] LaFleur and Foscue, "Agricultural Production in China." ECONOMIC GEOGRAPHY, Vol. 3, No. 3, 1927. p. 298.

[7] *Chinese Year Book*, 1925, p. 122, Geological Survey of China Reports.

[8] Leith, C. K.; "Mineral Resources of the Far East." *Foreign Affairs*, April, 1926, p. 435. (Leith considers that China's mineral wealth is

commercial grade and so accessible as to be of present use. China is also producing 75 per cent of the world's antimony and over 50 per cent of its tungsten; in fact, most minerals are found in workable form in China with the exception of chrome ore, sulphur, and nickel.

In spite of the fact that Chinese industry is probably the oldest in the world; that China was quite well supplied with the basic materials necessary to manufacturing; that the Chinese people have shown remarkable ability along many lines of endeavor; that the important western nations have all replaced the system of cottage manufacturing with that of the factory and have supplemented hand labor with machine work, China has failed to keep pace even with Japan in modern industrial development. Why should China not have developed a Henry Ford or a Thomas Edison?

One part of the explanation rested with its geographical isolation from important civilizations of the ancient and modern world (until late in her history). China was hemmed in on the west, the northeast, and the southwest by great mountain ranges and extensive deserts. Her eastern coast line borders the Pacific Ocean, which was almost a complete barrier. The chief access in ancient days was from the northwest by caravan over long desert stretches and through inhospitable mountain passes. There was no important nation either in the old world or the new, except Japan with its kindred peoples and inferior civilization, which could bring to

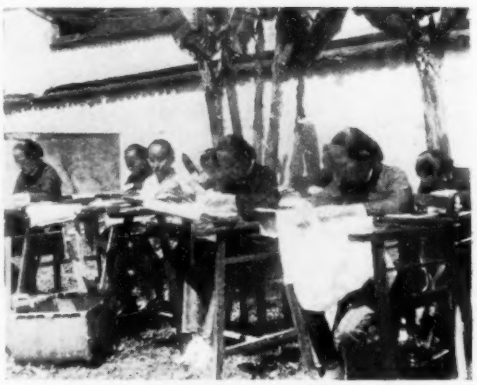

FIGURE 3.—Women of Soochow, China, are expert with the needle and with the assistance of the embroidery frame they turn out a cheap and substantial article. (Courtesy of Presbyterian Foreign Missions.)

China new products, new peoples, and new thoughts of sufficient number and importance to assist in the molding of her civilization. Geography has never been taught in the schools of China, even the geography of their own empire. Their knowledge of the outside world is both mythical and whimsical. They still believe the earth to be an immense extended stationary plain, while their knowledge of the earth's inhabitants is equally primitive. Their language, the most tedious and meagre of all tongues, together with the compelled emphasis upon the classical studies, have likewise made for isolation and have hindered the advancement of science, the foundation of modern industry.

In many ways the great size of China and the lack of efficient means of communication has handicapped her progress. In general, it was a self-sufficient country. Nature did not force the Chinese to take to the sea for a livelihood as it did the Norseman, the Saxon, and the Phoenician. There was no necessity to be other than land men dependent upon agriculture.

Steam and electric power for use in

not sufficient to form the basis of a modern industrial development, such as is found in the United States and western Europe.) (Her mineral supply is sufficient, however, for her to achieve a much greater development of modern industry than she at present possesses.)

transportation were also unknown to China in 1842.[9] Waterways were available, both natural and artificial, but access to many sections of the country could only be made by pony carts, wheelbarrows, and human carriers. The paucity of communications even today can easily be seen when comparison is made with the United States (See page 2.) This lack of transportation facilities consequently limited manufactured products to a local market, a condition which naturally set the limit of industrial output at a point which could be satisfactorily reached through the native methods of production and organization.

Improvements were made with great difficulty for such an ancient and isolated civilization resists modification by the tremendous power of custom. The fact that the family rather than the individual unit, as in the United States, was the working industrial basis, has slowed up the industrial machine. Associated with the family unit is naturally found that highly developed organization, the guild. These guilds regulated the industrial life of the country and they, rather than the individual, came in contact with the government. The guilds were largely responsible for retarding the growth of industry through their control of the number of individuals that could engage in a single line of manufacturing. The family system has made it very difficult for the Chinese to work together in an enterprise that was larger than the family unit could handle. The members of two families join in an enterprise with difficulty. Each family always suspects that the other will take advantage in the distribution of profits. Naturally, each starts to justify that suspicion; the result is ruin for the business. Individual honesty has nothing to do with the situation; it is all a matter of

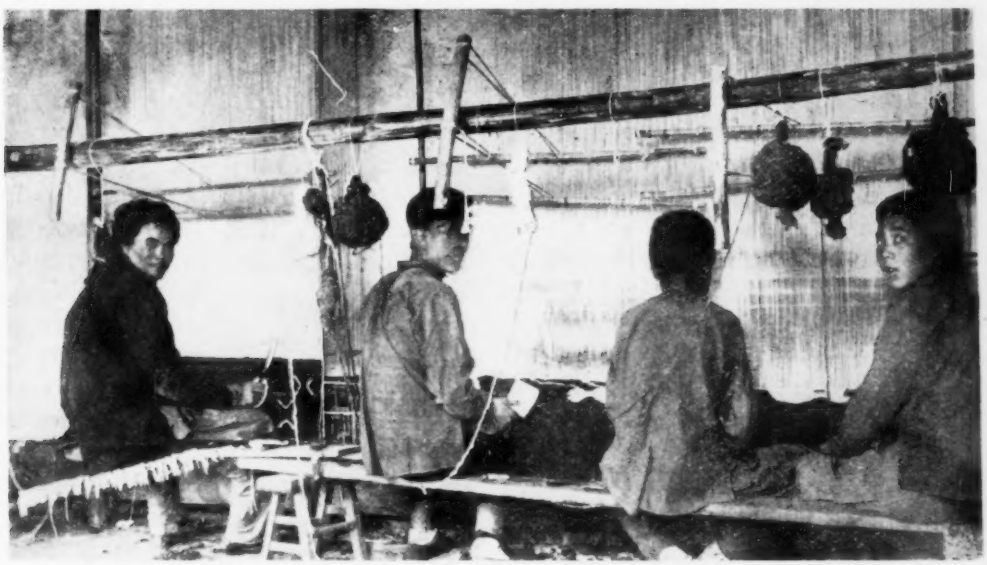

FIGURE 4.—Rug making at Yihsien. North China and Tientsin carpets, a name frequently applied to all Chinese rugs and carpets, are typical workshop products. Ninety per cent approximately of Chinese export comes to the United States. (Courtesy of Presbyterian Foreign Missions.)

[9] Vinacke, Harold M., *Problems of Industrial Development of China*, Princeton University Press, 1926.

social code. The family must always come first; everything else is secondary. Even with the development of modern industrialism, for the immediate future at least, the industries under complete Chinese control must be organized in comparatively small units—within the means of one clan.

Again, the government in China has had no vital relationship to industry, a condition exactly opposite to the situation in Japan. The Japanese government practically fathered the industrial development of Japan. This was possible because governmental leadership and guidance had prevailed in Japan for several centuries. The Chinese looked to their government only for protection from foreign foes and for internal peace. Compromise between organized groups, the families, the villages, the clan, the guilds is more to be relied on in industrial and social disputes than the state. Such customs worked when the industrial machine was simple, but such small groupings are not capable of the broad experimentation necessary to the enlargement of modern industrial activity. Scientific education, a state function, was neglected; the currency system was inefficient and unwieldy weights and measures differed in different communities. Property was safe up to a certain point, but undue accumulation of noticeable capital gave government officials an all too welcome opportunity for graft and plunder. Likin and other transit taxes placed a heavy burden upon the movement of goods. The position of the industrial worker and the merchant was the lowest in the social scale. All these things and numerous others [10] have played their part in causing the retardation of modern industrial development in China.

[10] Baker, John Earl, "Why Chinese Business is Not Business," *Asia*, May, 1928, pp. 390–397.

PRESENT CLASSIFICATION OF MANUFACTURING

China is still essentially a land of domestic handicraft and individual rather than corporate methods. Industry can be classified into three groups—the cottage, the workshop, and the factory.

THE COTTAGE

The *cottage* is the home of the *worker*. Here we find a division of labor on one particular product, among the members of the family. The unit is small, the raw materials are often obtained from a factory nearby in which the husband may be employed, and the workers are paid on the piece rate basis. The male members of the house may also be farmers or merchants. Many of the products made in the cottage, such as toys and reed mats, are for direct sale. Julian Arnold described clearly the latter type of the cottage industry. "In most Chinese cities a number of blocks on a street—sometimes a whole street—are given over to a certain industry, the street or quarter of the town taking the name of the industry. The shops are generally small, about 12 feet in width, and often have the whole front open upon the street. They usually are 20 or 30 feet deep, with a bit of open space or courtyard behind and with living quarters above. Often the whole family, which always includes children and sometimes relatives, lives here. The apprentices, when the establishment carries any, live with the family. A dog, a few chickens, and a pig may be part of the household. If the articles made by the family are finished products, they

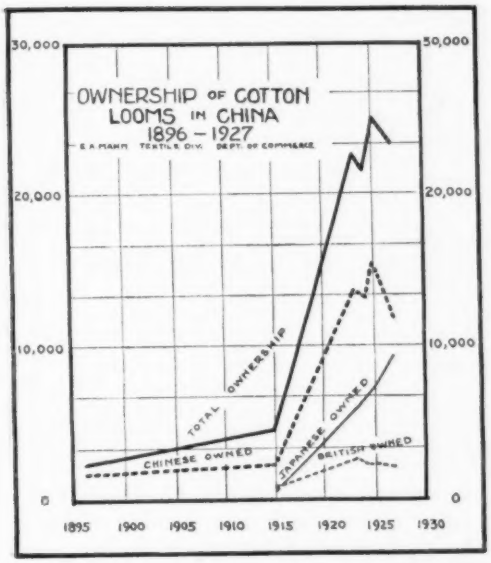

FIGURE 5.—All classes of loom ownership have shown great increase since 1915. The drop since 1925 has been limited to the Chinese and British looms.

are retailed in the shop. As a rule, shops which complete articles only in part occupy back streets or the work is done in households which present no appearance of shops." Fifteen hundred people are thus engaged in the artificial flower industry of Peking.

Hair net manufacture represents still another type of the cottage industry. This industry resulted from a cheap labor supply and a plentiful amount of human hair. The industry centers at Chefoo in Shantung Province, but in reality few hair nets are actually made in that city. In thousands of homes throughout the Shantung peninsula, the younger members of the family are making nets as a part time occupation, for it requires the keenest of eyesight. An expert worker turns out about 12 nets per day for a wage of approximately $10 to $20 *Mexican* per month. These finished nets are collected by itinerant buyers and brought to Chefoo for inspection and preparation for shipment abroad. The industry has had a setback recently, due to bobbed hair being the prevailing fashion among girls in the United States; consequently, the export of nets fell from a value of over $5,000,000 in 1921 to slightly over $2,000,000 in 1923.

The cottage industry is also frequently associated with store or factory. In the knitted sweater industry[11] of Shanghai which has increased considerably in recent years, the association of store and cottage is clearly seen. The knitting is distinctly a family industry carried on largely in the native quarter of the city. Two methods of procedure are followed. Some families work under contract with the department or general store. The family is furnished the yarn and is paid by the piece, the price approximately $1.20 for a man's, $1.00 for a woman's, and $.80 for a child's sweater. The largest sweater requires about two days of labor. Other more enterprising families, with a small money surplus, knit with their own materials and sell to the stores for prices ranging from $18 to $44 per dozen, depending upon the size of the garment. Labor is the predominant locating influence, for much of the wool used is imported largely from Great Britain, Germany and Japan.

An association between the factory and cottage in the knitted hosiery business was shown recently in an article by D. K. Liew.[12] In Pinghu, in 1926, ten thousand knitting machines produced $4,000,000 worth of hosiery. The factories were not ade-

[11] *The Chinese Economic Bulletin*, December 31, 1927, Vol. XI, No. 357, p. 352.

[12] Liew, D. K., "China's Industrial Development." *Chinese Economic Journal*, July, 1927, p. 659. (The classification of industry used in this paper is the same one as was developed by Mr. Liew.)

quate for the task; consequently arrangements were made for the distribution of the machines to the homes. The total cost of each machine distributed was in the neighborhood of $20. Each machine was rented for $2 per month with a deposit of $8 as a bond for the safe return of the machine. The raw materials, mostly yarn, were supplied by the factory and the piece rate varied from 22c to 26c per dozen pairs. The average worker could knit a dozen pairs a day, which was considered fair earnings for a woman in the home.

Paper fans from Hangchow, fire crackers from Nanning, palm leaf fans from Canton, rush hats from Ningpo, linen and embroideries from Chefoo, Swatow, Canton, and Peking, lace handkerchiefs from Loti, silk shawls from Canton, grass cloth from Swatow, mandarin coats from Peking, and many other handicraft articles, such as beads, old tapestries, brasses, carved jade and ivories, lacquer, and wood carvings are the product largely of Chinese cottage industry.

THE WORKSHOP

The workshop is a manufacturing establishment that was common in Europe in medieval times, and, as distinguished from a factory, it has no labor-saving machinery and no power plant as a part of the shop. In China it is slightly larger than its ancient European counterpart, employing at times more than 100 laborers. The proprietor is frequently, but not always, the master workman, but when a separate individual he becomes in reality a sleeping partner. The employees are called journeymen and apprentices. Excellent examples of this type of manufacturing are (1) porcelain, (2) furs and leather, (3) rugs and carpets, (4) rattan furniture, (5) Mah Jongg sets, and (6) mats and matting.

The Kingtechen Potteries[13] are the most outstanding workshops in China. They were established in A.D. 200 for the purpose of manufacturing pottery for the imperial household. It is the oldest porcelain city of China, if not of the world. The location was not accidental, but due to the presence of an abundance of raw material. More than a dozen kinds of excellent clay are found in the neighborhood. Just across the river is a large deposit of pure white clay. The plant has no modern machinery of any kind, making it necessary to turn out practically every piece of pottery by hand or foot. The kilns number in the neighborhood of 100, but they are not all active at one time. They are heated mostly with straw and wood. The workers are organized by regions and tasks into associations and guilds. The business is taught by means of the apprentice system, the apprentices receiving but little more than board and lodging. Real daily wages of $1 (Mexican) are paid only to expert potters and moulders. China has reputation, raw materials and the skill necessary for the development of an important ceramic industry. Her chief hindrances are (1) internal disorders, (2) traditionally conservative ideas of the profession, and (3) lack of organized capital.

Carpets and Rugs

North China and Tientsin carpets, a name frequently applied to all Chinese rugs and carpets, are likewise

[13] Shryock, J. K., "Kingtechen, the Porcelain City." *Asia*, November, 1920, p. 997. Dingle, *Far Eastern Products Manual*, Section 38. Ball, *Things Chinese—Porcelain and Pottery*. (Excellent treatises.)

typical workshop products. In unsanitary, poorly constructed workshops thousands of small boys by the dim light of kerosene lights are producing in Peking, Tientsin, Paotingfu, Kashgar, Khotan, Kuchar, and Sa-

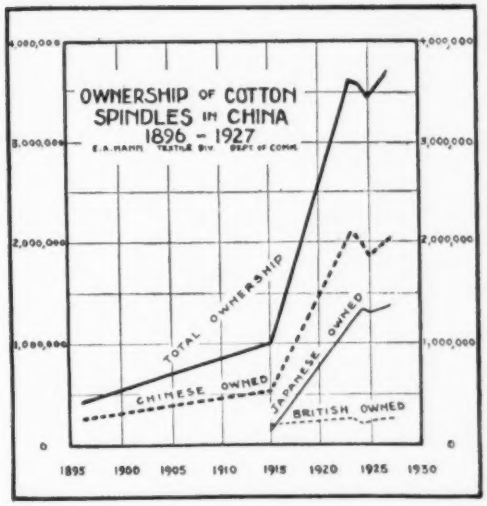

FIGURE 6.—Foreign-owned mills in 1896 had 158,000 spindles and 350 looms, but the ownership for that year by nationalities is not available. In addition to the Chinese, British, and Japanese mills listed for 1915, the total includes 1 Anglo-German mill, with 50,768 spindles and 1 German mill, with 53,200 spindles and 500 looms.

lachi, the Chinese rugs that are becoming so well known in the United States. These youths are usually bound out by their parents for three to five years as apprentices for pay amounting to nothing more than food and clothing. They are under the control of a foreman who usually works on a contract basis. The value of the output is practically unknown, but in 1923 exports were valued at about $4,000,000 (gold), 90 per cent of which went to the United States.

A treatise on Chinese handicraft would not be satisfactory unless the economic organization of a fairly typical Chinese town be presented. Paotowchen, with a population of 150,000, is such a city[14] that has not yet been greatly influenced by modern development. It is a walled town on the Yellow River (Figure 1), in Suiyuan Sad, and is the outpost of Chinese northwestern trade. Connection is made with the outside world by train and motor service, river boat and caravan.

The commercial and industrial groups are organized into hongs (guilds) and shes (associations). The hongs are made up of merchants of the same trade and the nine hongs include fur and skin dealers, oil and cereal dealers, sundries, native banks, pawnbrokers, commission houses, flour mills, breweries, and oil mills, trading firms, and livestock dealers. The sixteen shes are each made of one of the following groups: metal smiths, carpenters, restaurants, tanneries, skin curers, shoemakers, carpet weavers, blanket manufacturers, dyeworks, dry goods dealers, timber dealers, bean curd manufacturers, butchers, fruit dealers, inns, and paper makers. All hongs and shes are part of the municipal Chamber of Commerce.

Industry consists of the Chung Hwa Flour Mill Company, with an authorized paid-up capital of $300,000. The mill is equipped with fourteen rollers of American manufacture and is capable of turning out 2,000 bags every 24 hours. In addition there are 20 old style flour mills worked by draft animals. Three modern common soap factories have a daily output of 7,720 pieces. The local tallow is consumed only by old fashioned candle factories. There

[14] "Paotowchen, the Gateway of the Northwest," *Far Eastern Review*, June, 1926, p. 265. Two articles on two other Chinese cities contain valuable information—Hangchow; *Chinese Economic Journal*, August, 1927, and Ningpo, September, 1927.

are forty carpet and rug workshops, the largest of which employs 70 hands, with a total force of 400 weavers. The thirty odd tanneries and the fifty skin curers are mostly engaged in preparing low-grade leather. The oil mills equipped with old style presses are preparing a local product chiefly from sesamum and linseed. Paper is made here from discarded hemp ropes and local grass for local use. There are four glue makers. The city, a fairly thriving metropolis, is also a cleaning and repacking center for the Tientsin wool trade and a starting point for caravans that are engaged in western trade.

The more extensive development of home and village industries, which are relatively few for such a well populated country, would be a boon to the Chinese. The labor surplus is tremendous and in pursuits where labor is the principal item no country can compete with China; consequently, the possibilities are almost limitless. Such industries would provide a much-needed additional income, relieve the intensive pressure on the land, develop a higher buying capacity and utilize the spare time of the people to the advantage of the Chinese in particular and the world in general. It would probably require less capital than modern industrialization and make possible the necessary gradual changes so important to the future welfare of the country.

THE MODERN FACTORY

The modern factory system is still an infant in swaddling clothes, confining its efforts largely to the working-up of domestic raw materials, especially cotton and wheat. The principal industrial center is Shanghai because this city is a treaty port with foreign settlements under foreign rule, which assures security of life and property. Shanghai's modernization is further accounted for by the fact that it lies at the mouth of

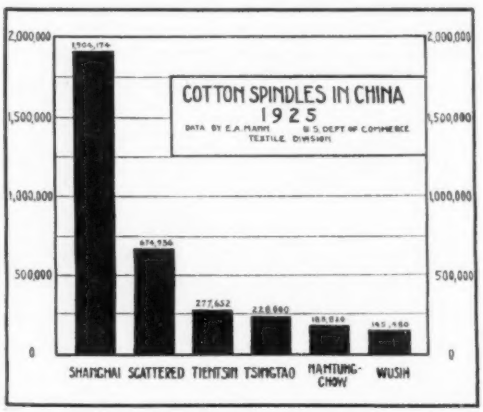

FIGURE 7.—The distribution of cotton spindles over China indicates the sections where industrialism is developing fastest.

China's greatest river, the Yangtze, which furnishes it as a hinterland the richest and most populous sections of China. Its harbor is one of the most improved and most modern of all Chinese cities, with steamship connections to practically all parts of the world. Here also the coastwise trade of China is more closely connected with interior points, both by rail and water, than at any other Chinese port.

Cotton Textiles

Cotton textiles is China's greatest modern industry. Its phenomenal growth since 1895, when there were only six native mills containing 183,000 spindles becomes apparent when examination is made of Figures 5 and 6.

China has many advantages for the development of this business. The domestic demand is enormous, that for yarn being greater than in any other country. There is an abundance of cheap labor which is not

subject to any legal restriction as to hours of work or age of employees. Labor conditions make the cost of production lower than in any other part of the world. Power is cheap whether developed by coal from native mines, from Japan or purchased from the municipality in Shanghai.[15] China ranks third among the countries of the world in the production of raw cotton. It has had an average annual production of 2,130,000 bales of 500 pounds each (1919–1923). This cotton is not of a high quality, but its low cost gives the mills marked advantage in the production of heavy sheetings and drills and low count yarn. (It is estimated that there are not in China over 100,000 spindles equipped to spin the finer counts.) Additional cheap cotton needed can be obtained from India. Moreover, textile manufacture is indigenous to China; the Chinese, therefore, become quickly familiar with the business.

From the present distribution of the cotton mills (Table 1) we can anticipate the future location of the major cotton manufacturing regions of China. The Yangtze Delta, a fertile and densely populated plain country with its admirable location at a focus of routes and in closer contact with the material civilization of the west than any other region, is the great cotton milling region. Two-thirds of the whole industry is concentrated in the Delta with over 50 per cent in Shanghai alone. Many mills are located along the railroad leading to Nanking, but elsewhere, except in Shanghai and Wusih, the mills of the delta are well scattered. Cotton is also manufactured in the Central Yangtze Basin and on the fringes of the North China Plain. In all three regions, the market centers

TABLE 1

DISTRIBUTION OF CHINESE COTTON MILLS, 1925
Commerce Reports, September 20, 1926

Ownership and Location	*Mills No.*	*Active Spindles*	*Active Looms*	*Operatives*	*Cotton Consumption 1,000 Lbs.*	*Production Yarn 1,000 Lbs.*	*Production Cloth 1,000 yds.*
Shanghai:							
Chinese	22	700,682	10,350	44,934	213,217	171,586	22,669
Japanese	32	998,172	5,836	55,488	314,477	185,777	14,400
British	4	205,320	2,348	16,500	52,000	33,820	.....
Kiangsu Province—outside of Shanghai:							
Chinese	19	413,568	2,104	27,580	85,032	74,345	24,500
Wusih*	6	137,992	750	3,785	78,125	13,750	.....
Nantungchow*	5	183,820	1,100	5,000	160,700	45,000	.....
Chihli (Chinese)	8	228,268	1,402	16,796	74,516	64,769	23,593
Hupeh (Chinese)	5	257,136	2,000	19,570	56,211	58,643	22,238
Honan (Chinese)	4	90,000	1,200	8,470	32,272	40,944	2,388
Chekiang (Chinese)	3	46,120	125	4,438	17,840	14,750	.....
Shantung (Chinese)	2	58,800	.....	5,400	21,466	21,128	.....
Shansi (Chinese)	2	9,600	.....	912	1,285	1,120	.....
Metropolitan District (Chinese)	1	1,080	.....	110	600	340	.....
Anhwei (Chinese)	1	15,200	.....	1,200	2,237	1,985	.....
Hunan (Chinese)	1	40,000	.....	2,380	15,467	13,870	.....
Fengtian (Chinese)	1	21,368	200	1,781	5,360	4,428	4,235
Japanese	13	328,748	1,369	4,200	11,600	31,710	6,000
Shantung	7*						
Chihli	2*						
Manchuria	3†						
Hupeh	1†						

* Report of the Chinese Cotton Mill Owners' Association, March 18, 1922, Shanghai.
† *Far Eastern Review*, February, 1926, p. 50.

[15] Shanghai Municipal Plant distributes 350,000,000 units annually at a cost of one cent gold per kilowat. Shanghai, *Commerce Reports*, July 25, 1927.

for raw cotton, especially the great commercial outlets, such as Shanghai, Tientsin, Wusih, Woochang, Peking, and Hankow have developed into cotton manufacturing towns (Figure 7). The figures, compiled by the Chinese Cotton Mill Owners' Association, show that Kiangsu Province produces about 30 per cent, Chihli 20 per cent, and Hupeh 18 per cent of the raw cotton. These provinces are also important in the same order in the number of cotton mills and spindles (Table 1).

Figures 5 and 6 indicate that the Japanese up until 1925 were increasing their control of the Chinese cotton industry very rapidly. This is probably still true, although in the matter of spindelage, the Chinese advance between 1925 and 1927 exceeded that of the Japanese, for it has been stated[16] that not over one-half dozen Chinese owned and managed mills could show a profit and that many of the Chinese mills were mortgaged to Japanese banks. The Chinese have been working under a faulty system of capitalization and inexperienced management. Opportunity came to them during the war with a consequent boom in building activity. Experienced Chinese managers were lacking, however, and the faulty laws governing corporation investment had led to extravagance with the net result of many failures and a heavily mortgaged industry.

In spite of an approximate increase of 200 per cent in the production of cotton yarn since 1915, and an increase in cotton consumption in her mills of 630,000,000 pounds,[17] the country is still under normal conditions one of the largest importers of cotton yarn and an important market

[16] *Far Eastern Review*, February, 1926, p. 50.
[17] *Commerce Reports*, September 20, 1926.

FIGURE 8.—Threshing rice. South China is the home of the rice plant. In North China and Manchuria where wheat is an important crop, rice is served at feasts as something special. (Courtesy of Presbyterian Foreign Missions.)

for cotton cloth. These statements indicate that the potential possibilities of the cotton industry in China are far from being realized. It is laboring under many heavy burdens. The militarists have been levying excessive and illegal taxation on the farming areas whence comes the food supply for the cotton factory workers. This has increased the wholesale index number for cereals for Shanghai from 144.6 in August, 1924, to 152.9 for March, 1925. The basis is 100 for February, 1913.[18] This condition is producing wage difficulties and labor troubles, which are difficult to remedy because the Chinese government is powerless. Speculation in domestic exchange, poor internal transportation, high internal taxes, a poor marketing system, the lack of government agencies for improving agricultural conditions, the lack of purchasing power of the masses and the inefficiency of Chinese labor are other factors that are militating against rapid improvement in the native cotton industry.

Flour Milling

Flour manufacture next to cotton is China's most important modern

[18] *Far Eastern Review*, August, 1925, p. 541.

industry. Flour milling is indigenous to China for, contrary to popular belief, not all Chinese are rice-eating people. In North China and Manchuria where wheat is an important crop, rice is served at feasts as something special. Even in South China, the home of the rice plant, wheat noodles are served as a savory dish. Forty years ago practically all of the flour was ground between stones in a most primitive manner. The bulk of it is still produced in the same way, but each succeeding year since 1897 witnesses the growth of the modern milling industry.

China, although a wheat-producing country with a crop that averages 300,000,000 to 400,000,000 bushels yearly, does not produce enough for her needs. Her 160 mills have an aggregate daily capacity of 120,000 barrels of flour or 270,000 fifty-pound bags. The export and import situation is indicated in Table No. 2.

TABLE 2

CHINA'S TRADE IN WHEAT (BUSHELS) AND FLOUR (BARRELS)

	Exports of Wheat and Flour		*Imports of Wheat and Flour*	
Years	*Wheat*	*Flour*	*Wheat*	*Flour*
1910–1913 (Av.)	4,000,000		4,000	1,500,000
1917	3,500,000	586,000	80,000	500,000
1918	4,000,000	1,400,000	.....	3,000
1919 *	11,000,000	1,830,000	.....	200,000
1920 *	18,700,000	2,680,000	75,000	340,000
1921 *	11,400,000	1,400,000	165,000	410,000
1922 †	2,500,000	400,000	2,000,000	2,450,000
1923 †	1,250,000	90,000	5,800,000	3,800,000

* Temporary situation, high prices abroad and the silver exchange situation favored exports.

† China suffered from a poor crop; wheat prices abroad dropped and the silver exchange favored imports of both wheat and flour.

In general, Table 2 shows an increasing demand for both foreign wheat and flour in China, a sign of the development of an important flour milling industry and the creation of an increased demand for better flour and flour products in China. The demand for foreign wheat is also due to the lack of transportation facilities within the country and the excessive taxes imposed on products in transit. In northwestern China (Shensi) wheat is produced at about one-third the cost of wheat produced in the United States. Hankow and Shanghai could, however, better afford to get their wheat from Seattle. In fact, Chinese mills have not according to Arnold been able recently to secure the supplies of native wheat essential to complete operation on a profitable basis because of (1) short crops, (2) unfavorable political conditions, (3) heavy internal tax exactions, (4) lack of any standard of quality in wheat production. Certain districts are producing small amounts of many different wheat varieties and there is also a tendency among growers and middlemen to water and adulterate their wheat.

Chinese modern flour mills, largely under Chinese management, compare quite favorably with those in the United States. The largest share of the equipment is American. The raising of the wheat, its threshing and delivery to the mill, are, however, still carried on by ancient methods. Coal is likewise delivered to the mills in many places by coolies with the aid of wheelbarrows while frequently the flour and bran are removed from the mills in the same manner, or else by trucks pushed or pulled by human draft animals. The flour produced is also not of the highest quality

baker's white flour. The middlings or shorts are left in the flour, a condition that causes the bran to have a large wheat content. This bran because of the lack of a domestic dairy industry, has only a small home market. Consequently (1919–1923), bran was exported to the average value of $3,500,000 per year. The distribution and capacity of the mills are indicated in the following table:

TABLE 3

DISTRIBUTION AND CAPACITY OF CHINESE FLOUR MILLS*

Area	*Mills*	*Daily Capacity in Barrels* (estimated) 1 barrel = 196 pounds
Manchuria	46	40,000
Harbin	23	17,000
Changchun	9†	5,000
Scattered	14	18,000
Shanghai	23	25,000
Wusih	8	9,000
Tsinan	10	11,000
Tientsin	7	7,500
Hankow	5	5,500
Scattered	61	22,000
Total	160	120,000

* Based on widely divergent data taken from *China—Commercial and Industrial Handbook.* Rea's *Far Eastern Manual. Far Eastern Review,* April, 1921, and February, 1925.

† Kuang Chengtze included; 3 mills.

Manchuria, one of the great flour centers, began the modern phase of the industry in 1902 with Russian capital and under Russian management. The choice of Harbin as the site of the first three mills was most logical for the city stands at the point where the Chinese Eastern Railroad crosses the Sungari River in the heart of the Manchurian wheat country. The black loam wheat lands of the Sungari, Nonni, and Hulan valleys furnish ample raw materials with the possibilities as yet enormous for future production. The Russo-Japanese War (1904–1905) came at an opportune time for the wheat industry. The demand of the Russian army produced almost a mushroom growth, the number of mills increasing from three to sixteen [19] during the period. Post war conditions threw the industry into a serious depression.

It survived, however, but did not regain its former importance until a new demand was created by the great war. In the meantime (1913), the first mill was built at Changchun in South Manchuria. Today there are approximately twenty-three modern mills in Harbin, nine scattered along the railroad in North Manchuria, nine in Changchun and vicinity, and one each in the cities of Darien, Kirin, Mukden, Kaiyuan, and Tiehling. These forty-six modern flour mills, together with the 2,000 scattered wofangs or native mills, use up more than 29,000,000 bushels of wheat each year out of a total average crop of 40,000,000 bushels. The annual production of the modern mills is approximately 19,035,000 bags of fifty pounds of flour each.

The chaos which followed the Russian Revolution practically put an end to Russian influence in the Manchurian flour industry. Only four mills are left in their possession in Harbin and of these four, two are reported to be joint enterprises. The Chinese, backed partly by German capital, have obtained control. There are three Japanese mills at Harbin. The market centers of North Manchuria appear destined to remain the center of the industry. They are more favorably located relative to the raw material, while in South Manchuria imported flour of higher quality competes more favorably with the local product. Coal is plentiful and cheap in Manchuria, an added reason for the future growth of the business.

[19] *Manchuria—A Survey,* Adachio Kinnosuki, 1925, pp. 231–232.

The development in *Shanghai and vicinity* is part of its great industrial growth due to favorable commercial conditions. Approximately 88 per cent of the wheat imports of China enter at Shanghai; Wusih is its satellite. The big problems facing the flour millers of Shanghai are the transporting of the wheat from the ship in the harbor to the mill and its storage. John H. Nelson [20] states that the standard and floating types of grain elevators are economically impossible for the mills are not equipped for the storage of bulk wheat. Their location on Soochow Creek, at a distance of approximately ½ to 1½ miles from its mouth, permits only shallow draft lighterage in small native craft, a situation which makes it easier to handle sacked rather than bulk wheat. (See Figures 12 and 13.)

Tsinan in Shantung Province draws on the 47,000,000 bushel average annual wheat crop of Shantung. Its advantageous position at the junction of two railroads, its treaty port connections and its accessibility to the port of Tsiangtao, together with its nearness to fuel, are added factors. *Tientsin and Hankow* are also near to raw materials, fuel, and transportation facilities. The remaining mills are scattered throughout the wheat country and are mainly under Chinese management, a condition that is becoming more and more true of the entire business.

FIGURE 9.—Drying hemp from Chinese timbers. Shantung. (Courtesy of Presbyterian Foreign Missions.)

[20] *Nelson, John H.*, Asst. Trade Commissioner; Special Report to the U. S. Department of Commerce, March 25, 1924.

IRON AND STEEL

A survey of the industrial development of China would not be complete unless mention be made of her iron and steel industry, the backbone of any important industrial nation. In this industry, China is backward not only in the production of pig iron which does not exceed 300,000 tons per year, but in the consumption of all types of iron products, which is only equal to 1/180 of that of the United States, 1/100 of England's, 1/10 of Japan's and 1/30 of the average world consumption. Her iron

ore and pig iron have been largely exported to Japan, that country since 1896 taking approximately 50 per cent of an aggregate production of 11,200,000 tons of iron ore by modern methods, and two-thirds of her yearly pig iron output. China produces, in addition, 500,000 tons by native methods.

The potential possibilities have not as yet been fully realized, but the chances for China becoming one of the greatest iron and steel manufacturing nations are exceedingly remote according to the opinion of such eminent geological engineers as C. K. Leith and H. Foster Bain. Her iron ore reserves of approximately 950,000,000 tons are scant (Fig. 14). The bulk of these ores, moreover, are of low grade, possibly less than 35 per cent iron content. It would last the iron and steel industry of the United States less than ten years. Her coal resources, however, are the greatest in Asia and are amply sufficient to meet her own needs for generations to come (Fig. 14). This makes possible a growing, but not a dominant, world iron and steel industry in China.

Iron and steel industrial development has centered primarily in two regions, namely South Manchuria and the Yangtze Valley near Hankow. North China is a third area with greater potential possibilities than any other part of China, but as yet infantile in its growth. The rest of China, less accessible to well concentrated raw materials, the sea and foreign influence, retains almost without modification the mining technique and the market conditions of old China.

South Manchuria

The potential possibilities of Manchuria as an iron and steel center have been overemphasized. Japanese capitalists began in 1917 [21] the erection of a model city at Anshan, sixty miles south of Mukden. This iron and steel center was to be a second Gary for the company had under its control 100,000,000 tons of easily accessible iron ore and 1,000,000,000 tons of coal located nearby at Fushan. The world looked with envy at this development. Later surveys showed, however, that much of the ore was less than 35 per cent iron content and the coal was primarily of the non-coking variety. The company has been compelled to use secondary enrichment ore of about 50 per cent iron. This ore is found in scattered pockets and in such small and uncertain quantities that its use has proved very unsatisfactory. Its coal, a fairly good coking variety, was obtained from the mines at Penhsihu, which made necessary a haul of 120 miles.

FIGURE 10.—Threshing wheat. The raising of the wheat in China, its threshing and delivery to the mill are still carried on by ancient and primitive methods. (Courtesy of Presbyterian Foreign Missions.)

[21] Hoyt, Lansing W., "Blast Furnaces and Steel Mills in China." *Far Eastern Review*, June, 1923; *Iron Trade Review*, January 18, 1923.

FIGURE 11.—Forty years ago practically all of the flour was ground between stones in a most primitive manner. The bulk of it is still produced in the same way but each succeeding year since 1897 witnesses the growth of the modern milling industry. (Courtesy of Presbyterian Foreign Missions.)

Such were the unfavorable conditions that the year's operation (1924–1925) of the South Manchurian Railroad's enterprises at Anshan and Penhsihu resulted in a net loss of yen 2,955,607.[22] So high is the cost of production, in spite of low labor costs, that Manchurian pig iron finds great difficulty in competing in the world markets with foreign iron unless subsidized by the Japanese government. Its production (1924–1925) was 95,110 tons of pig iron, of which 79,788 tons were sold for $1,494,683.

Altogether there are twenty-two iron works in the Mukden Consular District with an investment of $26,000,000, but all are small except the developments of Anshan and Penhsihu. They produce 102,000 tons of pig iron annually, largely exported to

[22] *Manchurian Daily News*, October 19, 1926.

FIGURE 12.—Wheat being transferred to native lighters for storage. Shanghai, China. (Courtesy of the U. S. Dept. of Commerce.)

Japan, five hundred tons of cast iron, fourteen hundred twenty-eight tons of iron pipe and machinery, and wrought iron, construction material, and the like to the amount of 72,000 tons. The small supply of high-grade iron and the high ash content (16%) of Manchurian coke, together with its large moisture content (10%) are disadvantages limiting the development of the industry.

China. This 1½ ton two carbon furnace [24] utilizes the cheap electricity furnished by the Shanghai Municipal Council at a cost of less than 1¼ gold cents (0.625d) per kilowatt hour. The plant, however, produces only for the needs of the company.

The electric power needs are ample in Shanghai and are developing rapidly. The 95 electric power plants

FIGURE 13.—A fleet of native lighters. Some of the larger mills own such fleets which they use to bring wheat from the steamers and godowns to the mills and to deliver flour and beans from the mills to the steamers. Shanghai. (Courtesy of U. S. Dept. of Commerce.)

Yangtze Valley

The Yangtze Valley iron and steel development is in its infancy as yet near Shanghai. In fact, Shanghai has only two small modern plants. The Wou-Ching Company [23] possesses two modern open-hearth blast furnaces with a capacity of 50 tons per day, but having only an average daily output of 20 to 30 tons. At the foundry of the Kingnan Dock and Engineering Works is located the only electric steel furnace that it is possible to operate at the present time in China. This 1½ ton two carbon furnace [24] utilizes the cheap electricity furnished by the Shanghai Municipal Council at a cost of less than 1¼ gold cents (0.625d) per kilowatt hour. The plant, however, produces only for the needs of the company.

The electric power needs are ample in Shanghai and are developing rapidly. The 95 electric power plants constitute about 25 per cent of the number of plants in China and approximately 40 per cent of their total generating capacity or 150,000 kilowatts. Near Nanking adjacent to Shanghai large iron deposits of possibly 85,000,000 tons (Fig. 14) have been discovered. English engineers have estimated that the largest of these deposits, the Fenghwang, contains some 30,000,000 tons of good grade iron ore that is as yet undeveloped. The production of ore is very limited due to primitive methods of mining, and a limited demand for pig iron for domestic consumption. The

[23] Howard, G. C., Special Report to U. S. Department of Foreign and Domestic Commerce, May 2, 1925.

[24] Hoyt, L. W., "Iron and Steel Industry in China." *Iron Age*, Sept. 6, 1923, p. 597.

annual output of 400,000 tons is largely shipped to Japan, a country that appears to control the mines although they are at the present time operated by Chinese. Good coal appears to be the limiting factor. Both anthracite and bituminous coal are mined in the vicinity and the reserves

FIGURE 14.—The great reserves of China will probably be slow of utilization because of transportation difficulties as well as Chinese lack of energy, equipment, and capital for development. (Chinese Year Book, 1926.)

of bituminous (225,000,000 tons) and anthracite (70,000,000 tons) appear large, but much of the former is friable, dusty, and high in ash and sulphur content, making it unsatisfactory at present for coke production. The coal production amounts to approximately 320,000 tons annually.

The center of the Yangtze Valley Iron and Steel Industry is near Hankow. The Hanyang iron works, the Tayeh iron and limestone mines, and the Pinghsiang Colliery are all the property of the Hanyehping Iron and Coal Company, one of the most important industrial corporations of China. In this district of five blast furnaces and the only rolling mill in China, the Yangtze Engineering Works with one blast furnace is the only independent operator. Its 100-ton furnace operates at a disadvantage for it lacks control of the necessary raw materials and means of transportation.

Tayeh Iron Mines

Seventy miles below Hankow and eighteen miles inland from the Yangtze River are located the iron and manganese mines and the limestone and dolomite quarries that are probably the best in China. The total iron ore body is estimated at 700,000,000 tons with 35,000,000 tons in sight of ore that assays 58 per cent iron content.[25] At present the old quarry system of stripping and blasting the ore is utilized. A short rail haul brings it to the Yangtze River. For this work four locomotives and 56 battleship ore cars are being used. Two furnaces nearby at Tayeh of 800 tons daily capacity take part of the ore. The rest is loaded by hand on towing barges for transportation to the Hanyang Works near Hankow, or on steamers destined for Japan. Of the annual output of 800,000 tons, Japan takes from 250,000 to 500,000 tons.

Hsiang Pei Shan Iron Mine

Fifteen miles by rail from Hwangshihkang, a port of the Yangtze, ninety miles below Hankow, are located ore bodies estimated at 20,000,000 tons of 63% iron content. The mines, owned and controlled by the Bureau of Mines of Hupeh Province (Fig. 15), are at present furnishing the ore for the Yangtze Engineering Works.

Pinghsiang Colliery and Coke Ovens

At Pinghsiang, Kiangsi Province (Fig. 15), about 315 miles from the

[25] *Mining and Metallurgical Industries of Central China.* Iron and Steel Division, U. S. Bureau of Foreign Commerce.

Hanyang Plant, is the source of its coal and coke. The estimated 500,000,000 tons of fairly good coking coal is mined at the rate of 600,000 tons a year. The coke is made in the old-fashioned rectangular beehive ovens and the fuel and coke is shipped seventy miles by railroad to Chuchow on the Siang River. From here it is transported by boat to Hanyang. At low water an additional 32-mile railroad haul is necessary.

The Hanyang Iron and Steel Works

Twenty-one tugs and 180 lighters, of the Hanyehping Company's fleet, bring the raw materials to the plant. Until recently the work of unloading was done by coolies, but large variation in the depth of the river (over 45 feet) caused so much trouble in wet and wintry weather, that modern mechanical unloading machines were installed. These large steel cranes unload under normal conditions about 3,000 tons of material daily. Much of the coal is still unloaded by hand.

The plant, one of the largest in China, produced on the average (1915–1921) approximately 140 tons of pig iron and 192 tons of steel, mostly rails. The raw materials used are as good a quality as any in the Far East, but on account of high transportation charges, the coke is expensive ($13.73 a ton). This condition, together with the fact that coke consumption is higher, for example, than in the Pittsburgh district,[26] makes the cost of pig iron production higher than in Europe, the United States, or India. It exceeds the Pittsburgh market quotation of $22 gold, in spite of lower costs of ore and labor. Although large for China, the furnaces would be considered too small for efficient operation in the United States. This, together with the fact that much of the equipment

FIGURE 15.—The coal and iron resources of China are becoming better known. For many years they were exaggerated, then underestimated, and now seem to be fairly well established. (Chinese Year Book, 1924.)

is obsolete, that the domestic demand has practically disappeared, and that transportation has been jeopardized by internal troubles, makes it impossible for this plant to compete with foreign material laid down in China.

Pig iron is as yet the chief product of the Yangtze Valley. In 1923 over 275,000 tons of pig iron valued at $3,803,894 was exported in addition to 341,333 tons of iron ore. This went mostly to Japan. Hanyang products are also consumed under normal conditions in China by engineering shops, foundries, and forges. The amount of steel produced at Hanyang depends upon domestic demand. Prior rights have been granted the company in the furnishing of rails for the Chinese government, but this demand is rela-

[26] The ratio is 1.2 in Hanyang to 1.0 ton of coke for every ton of pig iron produced in Pittsburgh. Ores smelted in both places have a similar percentage of iron. (Smith, *Coal and Iron in China*, p. 72.)

tively unimportant. The company, however, is under heavy obligations to Japan for capital which is to be redeemed by the sale of ore and pig iron,[27] a condition which makes possible Japanese control of the industry if the obligations are not satisfied. The Yangtze Valley will no doubt be one of the future centers of China's iron and steel industry, a situation that appears well understood, but temporary conditions halted the development of a new iron works at Shihweiyao on the Yangtze. Two very modern American type blast furnaces have been erected with no less than six additional ones projected.

Peking or Chihli District

This district has natural possibilities (Fig. 14), but as yet only one plant, the Lungyen Blast Furnace, of a rated capacity of 250 tons daily, has been built. This plant, undoubtedly one of the best arranged plants in China, was erected in 1921 at Lungyen, eleven miles from Peking on the Suiyuan Railroad, but in spite of being accessible to a large supply of good quality iron (45%), limestone within seven miles of the plant, and a fair coking coal, operating capital is not yet available for continuous operation. The difficulties confronting the development of this region, such as (1) the lack of a high quality coking coal; the coke contains 20% ash, 10% moisture, and the quantity needed (3,000 pounds) to produce one ton of pig iron using a 50% iron makes the probable cost of coke per ton as high as $16; (2) a heavy silt content of the water available for use which required added outlay for storage reservoirs and settling basins; (3) the small market for pig iron in China; (4) excessive likin or interprovincial taxation; (5) export duties; and (6) a tendency for Japan to favor the Yangtze plants because of greater financial interest, are serious drawbacks to early activity on a large scale.

Other modern industries, such as silk textiles, soy bean products, egg products and many more have developed in China, but enough has been set forth to indicate that the Industrial Revolution in China has indeed begun. The bulk of the industry, however, is no doubt still confined to the cottage and the workshop. Her greatest handicap is lack of centralized government control. She needs a strong hand at the helm of the ship of state in order that universal education be established; her mineral resources exploited; her railway mileage increased; her agriculture improved; her systems of weights, measures, and currency stabilized; her transportation and corporation taxes equalized; her prestige, credit, and fair dealing firmly established and peace instead of civil war become her heritage. If these things come to pass, then the whole economic and social structure of China will be fashioned to meet the conditions of the modern industrial era into which China is destined to enter.

[27] Tegengren calculates that it has committed itself to supply Japan with iron ore and pig iron in excess of the total ore reserves in its possession. (*The Iron Ores and Iron Industry of China*, Mem. Geological Survey of China—Part II, pp. 396–397.)

LAND RESOURCE INVENTORY IN MICHIGAN

Carleton P. Barnes
Forest Mapper, Michigan Land Economic Survey

WHEN the waste land problem in Northern Michigan became so acute that the whole state began to feel the burden of supporting the social order there, the state legislature initiated a detailed and comprehensive survey or inventory of the affected section to determine just what resources it possessed for future development, and possible self-sufficiency or economic independence.

Northern Michigan is a forest region. For more than two decades Michigan was the leading state in timber production. It had the finest stands of white pine in America. Now it produces, annually, less white pine than Massachusetts. The land that grew this pine was sandy land, poor land for agricultural development; so when land companies acquired it and sold it to individuals as good farm land, they were not conferring much of a favor, even though they sold it at remarkably low prices. Twenty dollars an acre was an average price for such land in 1918–1919, when farm land was generally high throughout the country, and twenty dollar an acre land at such a time could not fail to find buyers.

The physical factors were against them, however. They invested their money in land, buildings, and improvements, and then found, too late, that twenty dollar an acre land, this twenty dollar an acre land, at least, was every bit as cheap as its price would indicate. Their soils were acid and sandy, their winters were cold, their growing season short, and their markets distant. Most of them left their farms with broken hopes, and if they had not been able to complete their payments to the company, the land reverted to it to be resold, and the process repeated.

The outcome of this attempt at agricultural settlement brought to the public attention a fact that should have been a matter of more general knowledge. The pine lands were not farm lands. They were forest lands, and they still are forest lands, potentially.

The lumbermen, when they logged in Northern Michigan, were exceptionally thorough. They cleaned the country of pine, and left it full of pine slash. Pine slash is highly inflammable when dry, there were then no spark arresters on the locomotives, and organized forest fire prevention and protection was unknown. The slash, and whatever seed trees and growing vegetation remained, burned, not once but repeatedly, and the land was thus prevented from continuing its function as a producer of wood. It no longer produced much of anything in the way of timber, and it failed to produce agricultural crops. It had become idle land.

Michigan has nearly 15,000,000 acres of land that is virtually non-productive. This amounts to very nearly one-third the total land area of the state. Taxes are delinquent on a large part of it. More than 100,000 acres of it has already reverted to the state through the non-payment of taxes and there is no indication that the amount of tax delinquency will decrease soon. Some counties have

difficulty in maintaining roads and schools because so large a part of the area contributes nothing to their support. Many counties receive far more from state funds than they pay into the state treasury.

The non-producing lands in the northern part of the state are a distinct burden, not only to the counties in which they are located, and which they have reduced in many instances to a state approaching economic pauperism, but to the people of the more fortunate parts of the state, who are called upon to contribute to their support. People throughout the state have begun to show an interest in the predicament of the northern counties, and have begun to ask what might be done to alleviate the situation.

FIGURE 1.—A recent burn in Alger County. Repeated burning has prevented large areas from continuing their function as producers of wood, cover for game, and places for people to play. Michigan's efficient fire prevention organization purposes to make scenes of this kind unusual.

In the whole United States we have much idle land. Most of it was once useful land. It is the cut and burned forest land, land that is not the sort for farming but that has constantly been the scene of agricultural failure. It is found in most of our great forest regions, but probably nowhere has it constituted so severe a problem as in the Upper Lake States, Michigan, Wisconsin, and Minnesota. Of these three states, Michigan is perhaps the most unfortunate.

Idle land in Greenland or Antarctica has no serious consequence. In settled and organized parts of the world, land which has no use, and therefore produces no income, leads to economic misfortune. Land that was once found useful, and has now lost its utility, so that the industry and homes it once attracted it can no longer support, is especially bad. Land that is not worth using is not worth paying taxes upon, and any state that has much such land is carrying dead weight, for a part of it is not contributing to the public weal. The remaining useful land must assume the whole burden of maintaining the functions and attributes of organized society.

SUGGESTED REMEDIES

Foresters advocate the use of the waste lands for forest production, this to be achieved presumably by a

wholesale reforestation, if not by planting, by insuring a natural reversion to forest through adequate fire protection. A great deal might be achieved in this way if the achievement of such a plan were possible. Unfortunately, the only organization capable of undertaking wholesale forestry projects involving management and reforestation is the state, and it owns only a small part of the waste lands. There are, too, raw lands that are certainly capable of agricultural production. To apply blanket reforestation to large areas without examination of the physical conditions would not be the wisest solution.

FIGURE 2. — The site of a former magnificent white pine forest in the Brule Valley. Fire has hindered reproduction.

In 1919 the Michigan Academy of Science appointed a special committee to investigate means by which the unfortunate economic situation in Northern Michigan growing out of the great areas of non-productive land, could be remedied. This committee reasoned that, inasmuch as land will bear taxation only as a use for it is found, the solution of the matter lay in finding a use for the land, if there was any. They also reasoned that, prerequisite to any plan of land classification, and as a guide to classification and use, an inventory of the idle lands and their resources was necessary. This should be an inventory of the physical conditions in detail, and of the economic conditions, such as the history of local land use, population trends, and transportation facilities. The Academy adopted the proposal of inventory as submitted by the committee, the state legislature was influenced to provide funds for the work, and in 1922 an inventory of Charlevoix County was undertaken.

THE LAND ECONOMIC SURVEY: ITS AIM

The organization created to undertake this inventory was called the Land Economic Survey. It is primarily interested in recording every fact that may have a bearing upon the utilization of the land. It does not attempt to classify land according to optimum use. It does not suggest a use for a particular piece of land. It merely gathers all the facts regarding the physical nature of the land and its reaction to various

FIGURE 3.—A monument to the futility of trying to farm all kinds of land regardless of its nature; the result of a lack of knowledge of physical conditions.

uses in the past, in the belief that an intimate knowledge of these things is requisite to any intelligent attempt at classification of land and plan for its use. It was thought best not to undertake a classification of the land, for such an attempt at specification would involve the use of much personal judgment which would inevitably lead to criticism and controversy. "Classification implies a more or less specific rating of quality or value, and this rating involves some official discrimination, assignment, or designation, all of which are repugnant to American psychology, and experience. But inventory implies only an orderly arrangement of incontrovertible and pertinent facts."[1]

Classification, then, is definitely avoided, but inventory as a basis of plan is stressed.

SCOPE OF THE LAND ECONOMIC SURVEY

Recognizing three major uses of the land in Northern Michigan, forest production, agriculture, and recreation, surveys are carried on, with a view toward the ultimate use of the land for one of the three, as a guide to the facts to be recorded. Every fact having a possible bearing upon the use of the land for any known purpose is obtained. When the Land Economic Survey has finished its inventory of a county, there is very little in the way of natural resources, either soil, forest, recreational, or industrial, that it has overlooked.

SOIL INVENTORY

The character of the soil is very intimately related to the waste land problem of Northern Michigan. Over great areas the soils permit only a limited number of crops to be grown, and these can scarcely compete in the open market with those from

FIGURE 4.—The remnant of Mansfield, a town that has exhausted its means of support.

regions with more favorable conditions. In general, the distribution of good farm land is local. To provide a detailed knowledge of the distribution and character of different soils, the mapping of soil types is carried on somewhat in the same manner as that of the United States Bureau of Chemistry and Soils.

[1] P. S. Lovejoy, "Theory and Practice in Land Classification," *The Journal of Land and Public Utility Economics*, April, 1925.

Classifications are based upon the same criteria used by the Bureau, and wherever a soil is found that has been previously mapped and named by the Bureau elsewhere, the same series name is applied.

Soils are mapped on a scale of two inches to the mile, and all areas of distinct type ten acres or more in size are shown. The soil surveyor also indicates on his map the location of potholes or depressions, sink holes, terrace escarpments, wet spots, surface stone and gravel, rock outcrops, sand, gravel, and marl resources, and topography in five grades, based upon steepness of slope.

A detailed study of the agricultural treatment of each of the more important soil types, and their reaction to this treatment is made. Utilization studies of particular parcels of land, showing the relative success or failure of different crops and systems of economy are one of the best indications of the possibilities of the land for agriculture, and by making them, the Survey accomplishes the purpose of classification, without subjecting itself to criticism and controversy. It does not say to an owner that his particular piece of land should be used for this purpose, or that he is doomed to failure if he does that with it. It does show him what a similar soil has done with the economy he contemplates, what it has done when put in oats, hay, barley, pasture, or what not, in dozens of instances, and in how many cases a farm with soil like his has been successful, and how many times unsuccessful, and lets him draw his own deductions.

FIGURE 5.—Good agricultural land along the valley of the Michigamme River. Formerly a prosperous village based on the mining industry furnished a local market for crops. Today the village is decadent and markets are remote. (Courtesy of W. U. Garstka.)

COVER INVENTORY

Cover is mapped simultaneously with the soil. Cover here includes not only the forest growth, but every other form of native vegetation such

as sedge marsh, bluejoint grass, native upland grass, sweet fern, bracken, and the like. The forest mapper also shows the location of pastures, cropped land, orchards, and abandoned agricultural land.

The different types, density, and sizes of forest cover are mapped in considerable detail. There were 36 different cover symbols used in the 1928 field season, and these symbols permit of combination to express almost any conceivable condition of density of stand, average diameter class, or association of species.

Growth studies in stands of different types located on different soil types are made on selected sample plots.

BASE MAPPING

Since no accurately detailed base maps exist for most of Northern Michigan, one of the most useful functions of the Land Economic Survey is provision of carefully made and complete maps of the cultural base data, roads, railroads, towns and villages, stores, houses, and the like, as well as the natural base data, lakes, and streams. Each feature is mapped in its proper relation to the land net.

WATER POWER INVENTORY

During each field season an hydraulic engineer is engaged in running profiles on the major streams in the county being worked, making gauge readings of stream flow, and establishing permanent stream gauging stations, for the purpose of making a complete water power survey of the county. The cost of construction of plants and the market available to each site are included in the survey.

FIGURE 6.—Jack pine, the only forest cover on great areas of the sandy pine plains of Northern Michigan. It is of slight commercial value. Can these lands be made to produce valuable timber, or are they good for little except game cover?

RECREATION AND WILD LIFE INVENTORY

The opportunity for recreation offered by Northern Michigan is one

FIGURE 7.—A coniferous swamp, a source of pulpwood. The Land Economic Survey inventories such forest resources.

of its most significant assets. Recreational use of land was largely unorganized and was scarcely recognized as a definite, legitimate use until recently. Today there is a definite attempt at cultivating the use of the forest of Northern Michigan for recreation. Recreation has become so general a use that the provision of facilities for its enjoyment is a business productive of considerable annual revenue. The Land Economic Survey recognizes recreation as one of the three major uses of the land.

On every lake of any size a special survey of recreation sites, and the suitability of the lake for recreational development, is made. This involves mapping the extent of strand, the nature of the bottom, taking soundings to determine the depth of water, indicating the amount and distribution of submergent and emergent vegetation in the lake, and showing the character of the shore topography and the vegetation contiguous to the lake. This information is assembled in blueprint form as a special lake map for each of the more important lakes.

Game tallies are taken by the forest mappers. The exact location of observed game animals or birds is indicated on the map and the number and habitat recorded.

The temperatures of all streams encountered are observed and compared with the air temperatures in the immediate vicinity, for the information of the fish division in its business of stocking the streams with fish.

GEOLOGY AND MINERAL RESOURCE INVENTORY

The geological inventory includes a delineation of the surface geology, in order to make a more refined map than those already existing, as well as the location and examination of deposits of limestone, shale, sand, gravel, marl, peat, artesian waters, and any metallic ores that may be found.

ECONOMIC STUDY AND CORRELATION

Equipped with the detailed maps of physical conditions in the county, the land economist proceeds to correlate the physical character of the land with certain facts that he has observed regarding their value and use. He finds, of course, that the history of agricultural settlement tends to bear a definite relationship to these conditions. He finds that the physical nature of the land is

FIGURE 8.—Water power may be a valuable resource, but not all sites are so situated that they could feasibly be developed.

reflected in its assessed valuation, which is the expression of local judgment of its worth, in the purpose of the owners in retaining it, and in the amount of abandonment and tax delinquency to which it has given rise. Examination of Figures 11, 12, and 13 reveals the striking relationship. Figure 11 is a natural district map of Kalkaska County, prepared by Mr. DeVries, the land economist. Each natural district represents a region with a definite combination of the three outstanding natural features, soil, topography, and cover, and is a composite of the soil, lay of the land, and cover maps made in the field, with the more closely asso-

FIGURE 9.—There are many undeveloped recreation areas and sites in Northern Michigan. The Land Economic Survey investigates their nature and character.

FIGURE 10.—Recreation in Northern Michigan depends to a great extent upon the forest. Forest cover inventory has a direct bearing upon recreational possibilities.

ciated types combined. The boundaries of these districts are not generalizations of the boundaries established in the field, but follow them in considerable detail. Figure 12 shows the assessed valuation of land in Kalkaska County. Note how closely low and high valuations follow the distribution of certain natural districts. The lowest valuations and the greatest amount of public holdings (which have become so almost invariably through tax delinquency) are found on the sandy pine plains and on the sandy oak and pine hills with few exceptions. The highest valuations, with one or two notable exceptions, occur on the sandy loam hardwood uplands, with the sandy loam hardwood plains having somewhat lower valuations, but higher than the pine plains and hills. It is evident that in most cases the assessment of cut-over land is based upon the value of land for future agricultural development.

Examination of Figure 13, the map of intent in ownership, reveals the reason why the assessed valuation does not follow the natural districts even more closely. The exceptions are found where a use of the land other than agriculture is the motive in holding, although exceptions do not follow in all such cases. Thus, where merchantable timber or recreational sites are present, the assessed valuation does not bear the same relation to the natural conditions, as when agriculture is the only use in view.

The intent or purpose of the Land Economic Survey in undertaking this correlation is defined by the light that past uses of these natural districts in large numbers of instances, throws upon the possible success or failure of future undertakings, and so, in this connection, a history of agricultural settlement in each district is recorded.

The land economist prepares an ownership map of the county, on which the name of each owner of property appears. He studies the geographic relationships affecting local industries, makes a survey of market and transportation facilities and conditions, obtains the records of shipments of commodities in and out of the county, as indicative of

its business, and makes a study of the local trading centers in their relation to the area tributary to them.

ORGANIZATION

The Land Economic Survey is a division of the Michigan Department Conservation. It coöperates with more soil surveyors from the Bureau during each field season. It also coöperates with the soils department of Michigan State College, which furnishes a soil scientist on classification and type characteristics.

In its forest mapping it coöperates with the United States Forest Service,

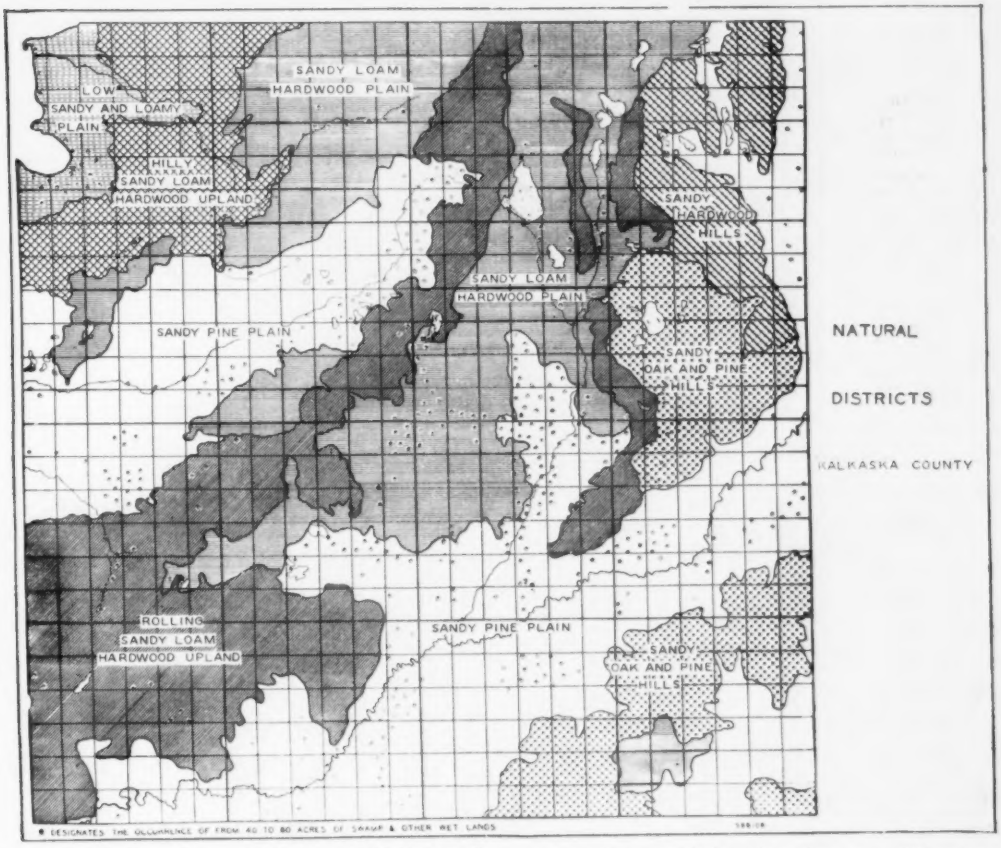

FIGURE 11.—Natural districts of Kalkaska County, based upon relief, soil, and cover. (Courtesy of Wade DeVries, Michigan Land Economic Survey.)

each of the other divisions, providing them with such information as it can, to help them in their functions, and receives from them such aid as they can give.

In its soil mapping and classifications it coöperates with the United States Bureau of Chemistry and Soils, receiving the advice of a soil inspector, and the services of one or particularly the Lake States Forest Experiment Station.

The division is in charge of a director. The economic studies and correlations are in the hands of the land economist. The soil mapping is in charge of the staff soil surveyor, who has a full-time assistant, and, during the field season, twelve soil mappers under his direction. The forest map-

ping is under the direction of the staff forester, who has a full-time assistant and twelve forest mappers during the field season to assist him. The staff hydraulic engineer and staff geologist are employed during the field season only. The personnel also includes the staff draughtsman, and an office assistant, and, during the field season, a base mapping and control party, ordinarily consisting of a traverseman, a compassman, and a chainman.

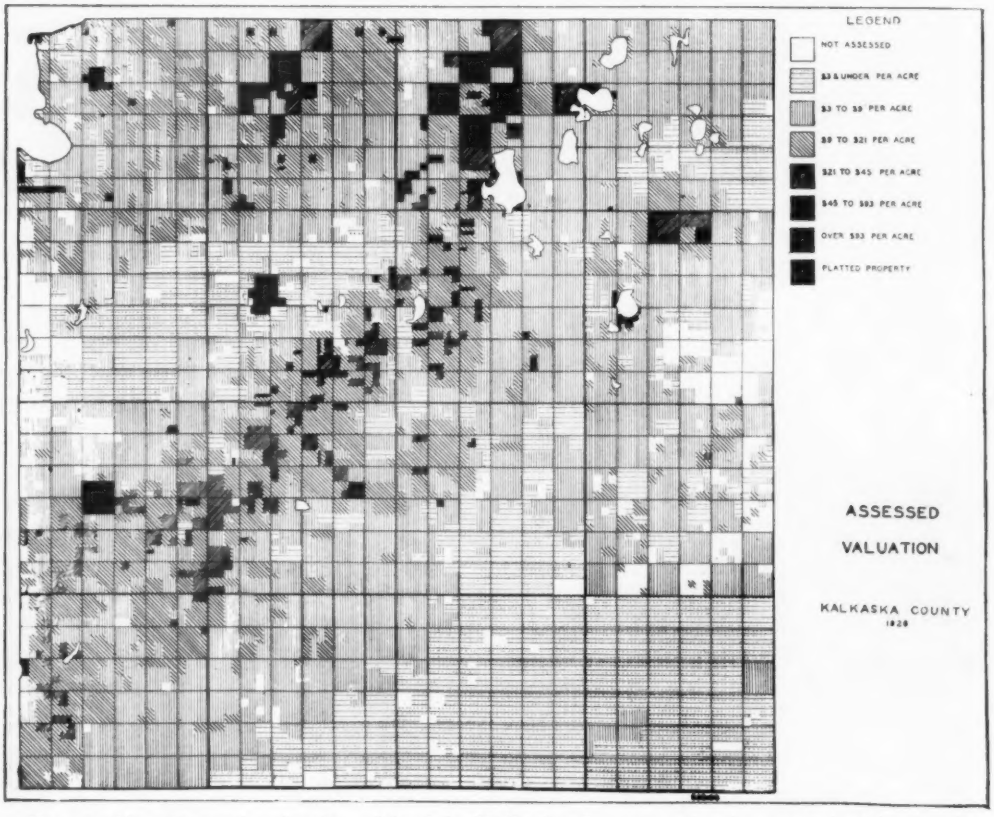

FIGURE 12.—Assessed valuation of land in Kalkaska County, a local appraisal of land value. (Courtesy of Wade DeVries, Michigan Land Economic Survey.)

FIELD TECHNIQUE

The methods used by the Land Economic Survey in mapping base, soil, and cover, are an evolution from several years' experience, during which time they have undergone many refinements. The compass and pacing method is used by both soil surveyors and forest mappers, who work in pairs, the soil and cover types being mapped simultaneously on a given area. The land net, established by the United States General Land Office, is used as control, wherever evidence of its location occurs, in the form of corner markers, or line roads, or fences. Where additional control is needed it is set by resurveying lines from an established corner with compass and chain, and marking the location of corners determined thereby. Additional control is obtained by plane table traverses of the major road

system of the county, and from railroad and highway alignments, where they are obtainable.

Each pair of mappers is assigned an area of one quarter-township, or nine square miles, at a time. These men work back and forth across this area on the section and quarter-section lines, keeping their direction by compass and the distance travelled by pacing. In this way, each section is crossed at least twice, and no feature is more than one-fourth of a mile from some point where the mapper has been. Boundaries that cannot be determined directly from the line, are found by making perpendicular offsets to them, or by triangulation. Roads, railroads, abandoned railroad grades, and principal stream courses are traversed carefully. Mapping is done on a sheet of vellum paper on which is printed the section, quarter-section, and eighth-section lines of a quarter-township, in such a way that each line is a graduated scale, thus obviating the necessity of applying a scale to the map each time a boundary or other feature is drawn. These sheets are held in springbinder aluminum notebooks. The mappers are supplied with protractors for plotting bearings. The standard United States Forest Service compass is used with jacob staff in running the

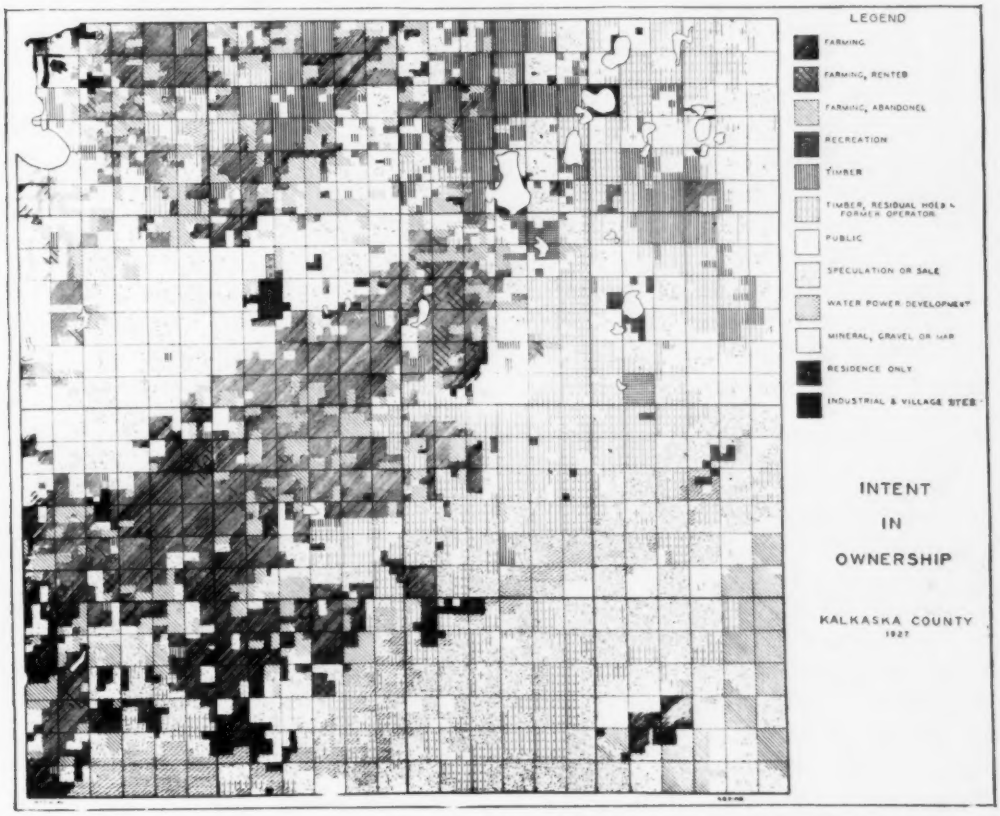

FIGURE 13.—Intent of owners in holding the land. Kalkaska County. Where the land is held for a use other than agriculture, the ordinary relationships between assessed valuation and the natural districts may not hold. (Courtesy of Wade DeVries, Michigan Land Economic Survey.)

lines and in reading bearings. Ordinarily the forester runs the line, but both soil surveyors and forest mappers carry compasses. The soil surveyor carries a soil auger for examining the profile, color, and texture of the soil, and a tube of "soiltex", a reagent for determining the acidity or alkalinity of soils.

The completed field sheets are joined with those of the adjacent areas, inked by the field mappers, and turned over to the checkers, who take them into the area and examine them for errors or omissions. Both soil and cover sheets are required to show all areas of a distinct type ten acres or more in size.

The county is taken as the unit of operations, and one or two counties, depending on their size, are inventoried each season.

STATUS AND ACHIEVEMENTS

The Land Economic Survey has inventoried to date (Nov., 1928) an aggregate of 8,840 square miles, all in the northern part of the state. It has come to be the recognized and accepted information gathering bureau of Northern Michigan. Its scope has yearly become more comprehensive, and the demand for its services on the part of other state bureaus, individuals, and private organizations has constantly grown. It has established inventory as the prerequisite to an intelligent plan for efficient use of the land. It has obtained and made available information that should go far toward preventing a recurrence of the maladjustment of land use to the physical conditions, that has prevailed.

Such an inventory shows where the good farm lands are, so that they may be reserved for agriculture if necessary, and not used for something economically less productive. It shows the state forest division where the establishment of state forests may be undertaken without the inclusion of land that should be used for agriculture. It shows just how much timber there is on a given piece of land, in what condition it is, whether it is now merchantable, if not, how long before it can be used, how thick or open is the stand and how much planting will be necessary to bring it into a full measure of production, and where the present and potential reserves of pulpwood, telephone poles, railroad ties, flooring, veneer wood, or Christmas trees are. It shows where and in what kind of habitat deer, beaver, grouse, or ducks are plentiful, and therefore where and when protection should be used, what streams are favorable to the planting of fish, what land has just the right cover and drainage for public or private game preserves, deer yards, or muskrat farms. It shows where the developed recreation sites are, where the undeveloped are, what their nature is, what kind of lakes, with what kind of shore and beach there is, what kind of forest occurs on the shore, and how much game there is to be found in the vicinity. It shows where the available water power sites are, how much it would cost to develop them, and whether there would be a market for the power if it were developed. It shows where the resources of gravel, limestone, marl, shale, or sand are, their extent, and their accessibility. It shows where the abandoned railroad grades are, in case they are needed for roads or fire lines, where the first- and second-class roads, the trails, and the lakes and streams are. It supplies an accurate, large-scale base map such as few counties have.

The cost of the field work for this inventory has averaged about 2.5 cents an acre. In one county of 530 square miles, the cost of the field work was $8,500. The office work, including publication of maps increases this amount about 50 per cent. There is little doubt that the loss to single individuals through the lack of a knowledge of physical conditions, has equaled the entire cost of inventorying the county.

INVENTORY AND THE IDLE LAND PROBLEM

Maladjustment of land use to the land and its physical conditions has resulted in great economic loss to individuals and communities, and large areas of unproductive, nontaxable land, in many parts of the country.

This maladjustment, with its resulting loss, could have been obviated, had an intimate knowledge of physical and economic conditions been available. Such a knowledge can best be made possible through intensive and comprehensive inventory. On this premise the Michigan Land Economic Survey operates.

(NOTE.—The writer is indebted to Mr. L. R. Schoenmann, Director, and to Mr. Wade DeVries, Land Economist of the Michigan Land Economic Survey, for many helpful suggestions.)

AGRICULTURAL REGIONS OF NORTH AMERICA

Part VII—The Middle Atlantic Trucking Region

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THE Middle Atlantic Trucking Region owes its existence principally to three conditions:

1. The series of large cities that extend from Washington to Boston and afford the greatest market for fresh vegetables and fruits in North America, if not in the world. The population of this string of cities and adjacent towns exceeds 13,000,000 which is about one-ninth of the total population of the United States.

2. Sandy to loamy soils that warm up rapidly in the spring time, are readily cultivated, respond well to fertilization, and produce vegetables of high quality. On the other hand, these sandy soils are not so well adapted to hay or the small grains as the heavier soils inland.

3. A mild, semi-marine climate, having a long frost-free season and springs so warm, especially in the southern portion of the region which is nearer the Gulf Stream, that vegetables and small fruits can be shipped to the large urban markets one to three weeks in advance of the crops from inland districts at the same latitude.

This Middle Atlantic Trucking Region extends from near Charleston, South Carolina, to Portland, Maine. It includes only the lower Coastal Plain in the Carolinas, Virginia, Maryland, and Delaware, but in New Jersey all the Coastal Plain is included and a little of the Piedmont. In New York it comprises not only Long Island, but also the Uplands of Westchester and Rockland counties, while in New England the coast west of New Haven and the Connecticut Valley becomes a part of the Belt; also that portion of Rhode Island, Massachusetts, New Hampshire, and Maine east of a line from Providence to near Lowell, thence northeasterly to a little beyond Portland.

Unlike the agricultural regions to the west, which occupy east-west belts determined largely by temperature, the Middle Atlantic Trucking Region extends from southwest to northeast through ten degrees of latitude. But owing to the ameliorating influence of the ocean, the range in temperature between the northern and southern sections of the region is not nearly so great as between similar latitudes inland. In the Carolinas the region adjoins the Cotton Belt; across Virginia and Maryland and along the Delaware River between southeastern Pennsylvania and New Jersey it borders the Corn and Winter Wheat Belt, while in northern New Jersey and in New England it extends into the Hay and Dairying Region (Fig. 180). Indeed in southeastern New England, as around New York City, this Middle Atlantic Trucking Belt, because of the demand of the large cities for fresh vegetables and small fruits, climbs up off the sandy soils of the

FIGURE 180.—The Middle Atlantic Trucking Region extends along the coast nearly 1,000 miles, from Georgetown, South Carolina, to Portland, Maine, and inland a distance averaging 50 miles, and nowhere exceeding 100 miles. In practically every county in this region potatoes, vegetables, and small fruits are the dominant crops, based on value, except in the tobacco districts of the Connecticut Valley and eastern North Carolina, and in the peanut district of southeastern Virginia and northeastern North Carolina. The mild climate of the region is owing not only to the proximity of the ocean, but also to the numerous bays that indent the land—Pamlico and Albemarle Sounds, Chesapeake Bay, Delaware Bay, Long Island Sound, and Narragansett Bay. These estuaries give much of the region a peninsular character and almost an insular climate. Because of this climate and the largely sandy soils, the same crops are grown throughout the region (except for cotton in the Carolinas), despite the fact that the southern portion of the region adjoins the Cotton Belt, the central portion the Corn and Winter Wheat Belt, and the northern portion the Hay and Dairying Belt.

Coastal Plain or alluvial deposits and extends a few miles into the granitic or metamorphic hills that characterize this portion of the Hay and Dairying Region.

The Middle Atlantic Trucking Belt is over 900 miles long, but is nowhere more than 100 miles wide, and averages only about 50 miles in width. It is the smallest of the agricultural regions in eastern North America, and only the Columbia Plateau Wheat Region is smaller among western regions. The land area is roughly 24,000,000 acres, which is only a little over one per cent of the land area of the United States. The crop acreage is also only about one per cent of the total crop acreage of the United States. But because the region includes New York City and Boston; as well as Norfolk and Portsmouth, Virginia; Atlantic City, Camden, Newark, and Jersey City, New Jersey; New Haven and Hartford, Connecticut; Providence, Rhode Island; Springfield, Fall River, Lowell, and many other towns in Massachusetts; also Portsmouth, New Hampshire, and Portland, Maine, the total population, about 17,000,000, constitutes over 14 per cent of the population of the United States (Fig. 181). However, only about 800,000 of this population, or less than 5 per cent of the total population of the belt, live on farms. The number of farms in the belt is 166,000, hence the average number of people per farm is 4.8. The average for the United States is only 4.55.

The region produced crops in 1919 having a farm value of over $400,000,000. Later figures are not available. This was less than 3 per cent of the total for the United States, but was produced, it will be recalled, on about one per cent of the total land area of the nation. About 40 per cent of the value of all crops in the region consisted of vegetables, potatoes, and fruits,—fully 50 per cent excluding the Carolina sections. However, only about 18 per cent of the acreage of all crops was occupied

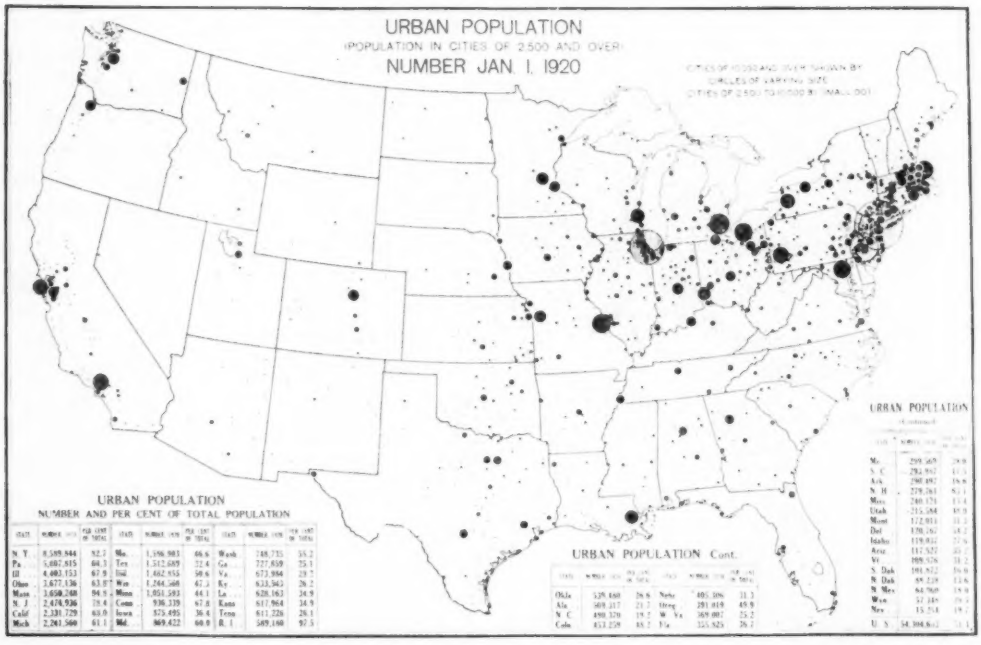


FIGURE 181.—Three of the largest cities in North America—New York, Boston, and Newark—are located in the Middle Atlantic Trucking Region, and three others—Philadelphia, Baltimore, and Washington—adjoin it or are near. The three large cities in the region and a myriad of smaller cities, manufacturing towns and suburbs, bring up the urban population of the region to about 16,000,000, while the population living on farms is only about 800,000. It should be noted on the map that all the large cities are located in the northern portion of the region, and that there are not even any small cities in the southern portion of the region, except Norfolk and Portsmouth, Virginia, and Wilmington, North Carolina. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

by these intensively cultivated crops. In no other region, except the Pacific Subtropical Crops Region of California, do the vegetables and fruit crops constitute so large a proportion of the value of all crops. However, in the Middle Atlantic Trucking Region, vegetables and potatoes are much more important than fruit, whereas in the Pacific Subtropical Crops Region the fruits are dominant (Figs. 182 and 183). It is interesting to note that here on these two coastal margins of the continent, horticulture dominates, while in nearly all the 2,500 miles that lie between, agriculture, that is, the production of grain and hay and livestock, is much more important. It is also interesting to note that these two horticultural regions are among the most densely populated in North America.

In addition to vegetables and fruits, tobacco, corn, and hay are important crops in the region. Indeed, corn and hay occupy each a larger acreage than the total of vegetables, potatoes, and fruits, while the tobacco crop occupies an acreage almost equal to that of the fruits or the vegetables. The corn is grown mostly in the southern part of the region, the hay mostly in the northern portion, and the tobacco in the Carolinas to the south and in the Connecticut Valley to the north.

PHYSICAL CONDITIONS

The northern end of the Middle Atlantic Trucking Region is 700 miles north of the southern end; yet,

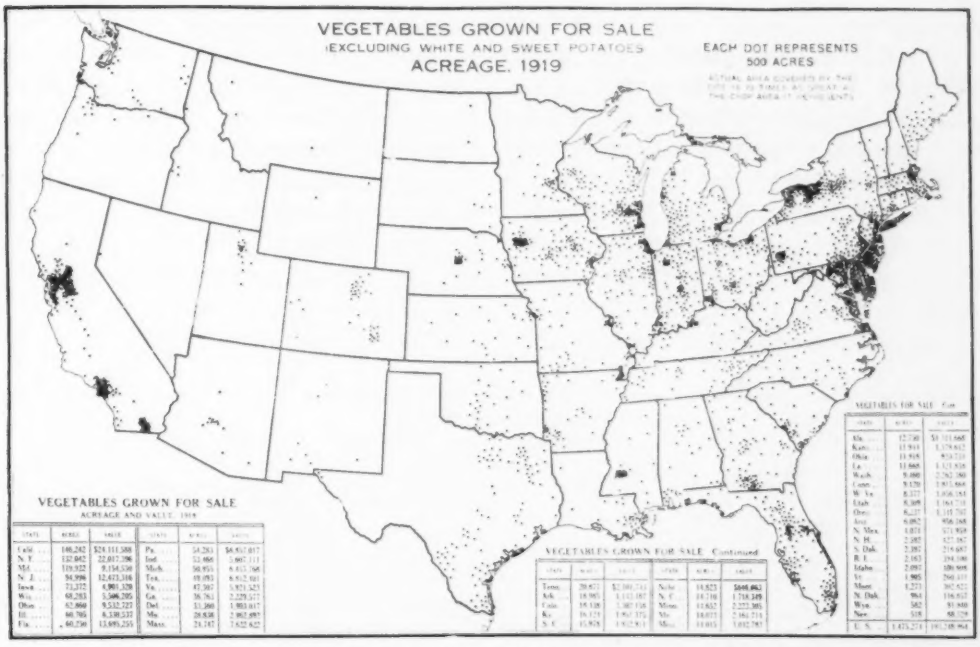


FIGURE 182.—The most important area of vegetable production in North America extends from Norfolk, Virginia, to Boston and beyond, with a gap in eastern Connecticut and western Rhode Island where the hilly New England upland adjoins the ocean. The portion of this area of vegetable production, in which the value of the vegetables and fruit exceeds that of all other crops, is included in the Middle Atlantic Trucking Region. A second important vegetable producing area extends from Utica, New York, west to Buffalo and Erie. Another belt surrounds the southern half of Lake Michigan. Florida and southern Georgia, where perhaps one-third of the winter vegetables are grown, may be said to constitute a fourth area. California possesses three important areas—the Sacramento-Stockton district, the Los Angeles district, and the Imperial Valley. In California also the winter crop is important. Smaller centers of production adjoin most of the large cities. The products from several of these areas compete with the products of the Middle Atlantic Trucking Region in the markets of the large Atlantic Coast cities. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

the same crops are or can be grown throughout the Belt, except for the small acreage of cotton in the Carolina and Southern Virginia portions.

Boundaries

The landward boundary of the region is drawn where the value of the vegetables and fruits (tobacco, also, in the Connecticut Valley), all intensively cultivated crops, no longer constitutes more than half the value of all crops, except that in Virginia it includes the peanut district, and in the Carolinas it is drawn where cotton has a larger value than that of all other crops. In the northern portion of the region, as already noted, especially near the large cities, this boundary is pressed beyond the coastal plain onto the granitic uplands; but from Trenton, New Jersey, southward to Wilmington, Delaware, it follows the Coastal Plain border as marked by the Delaware River. Across Delaware, Maryland, Virginia, and North Carolina, the boundary of the belt retreats from the "Fall Line," and includes only the lower and sandier section of the Coastal Plain. Near Georgetown, South Carolina, the belt merges into the Humid Subtropical Crops Belt. The southern limit might, perhaps, from the standpoint of vegetable production, have

been drawn south of Charleston, South Carolina, or even below Savannah, Georgia. The boundary has been placed near Georgetown, South Carolina, because the Sea-Island cotton and rice crops, both almost subtropical in their climatic preferences, were formerly grown as far north as this city. The cabbage palm (palmetto) also grows along the coast as far north as Georgetown.

In the New England section this precipitation is quite evenly distributed through the year, about 4 inches each month, except that the winter and early spring months are a little more moist. But from New York City southward, the rainfall is heaviest in July and August, when 5 inches or more are usually received each month, and lightest in the autumn, when only 3 to 4

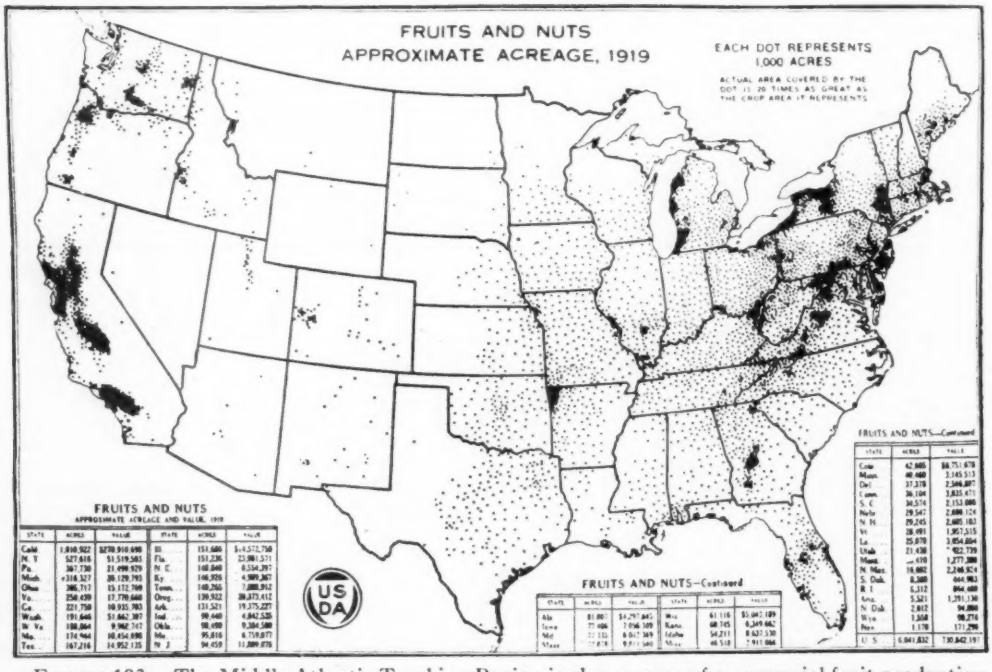

FRUITS AND NUTS
APPROXIMATE ACREAGE, 1919
EACH DOT REPRESENTS
1,000 ACRES
ACTUAL AREA COVERED BY THE DOT IS 20 TIMES AS GREAT AS THE CROP AREA IT REPRESENTS
FRUITS AND NUTS
APPROXIMATE ACREAGE AND VALUE, 1919
FRUITS AND NUTS—Continued
FRUITS AND NUTS—Continued
U.S. 6,041,832 730,842,197
USDA

FIGURE 183.—The Middle Atlantic Trucking Region is also an area of commercial fruit production, particularly the New Jersey, Delaware, and eastern Maryland sections. The leading fruits in this portion of the region are peaches, strawberries, and the bush fruits. In the eastern Massachusetts section there is an important apple-producing region northwest of Boston, while the leading cranberry district in the world is located in Plymouth and Barnstable counties (Cape Cod district). The second most important cranberry district is in southern New Jersey. Grapes are also grown in New Jersey and blueberries in the sandiest soils. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

Climate

The Middle Atlantic Trucking Region has a moist, almost marine, climate. The average annual precipitation is 40 to 50 inches in the northern portion, and 45 to 55 inches in the southern portion, where, however, the evaporation is also greater. inches of rainfall occur per month. The average snowfall ranges widely —from 1 inch in the South Carolina portion of the Belt to 60 inches in the southern tip of Maine. The southern end of the Belt is almost snowless, only one day a year in which snow falls, while the northern end is covered with a snow blanket

for 90 days in the year. Severe droughts are infrequent, periods of 30 days without rainfall during the growing season occurring in about half the years in the New England sections, but in only a third of the years in the Virginia and North Carolina portions of the region. The relative humidity is not high, but is somewhat higher than farther inland. It averages 70 to 80 per cent coast. To go east from Washington, Baltimore, or Philadelphia to the coast in summer is normally equivalent in temperature to going 150 miles north, while in winter it is equivalent to going about 100 miles south. Although the prevailing winds in winter are off the land, and in summer also, except along the Carolina and New England coasts, the ocean, nevertheless, exerts a

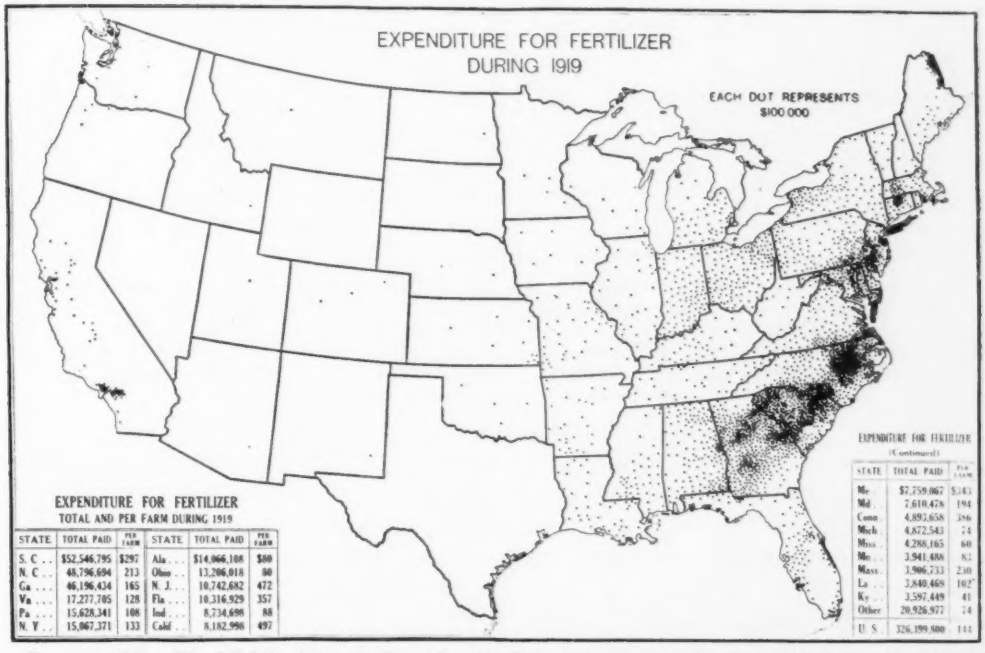
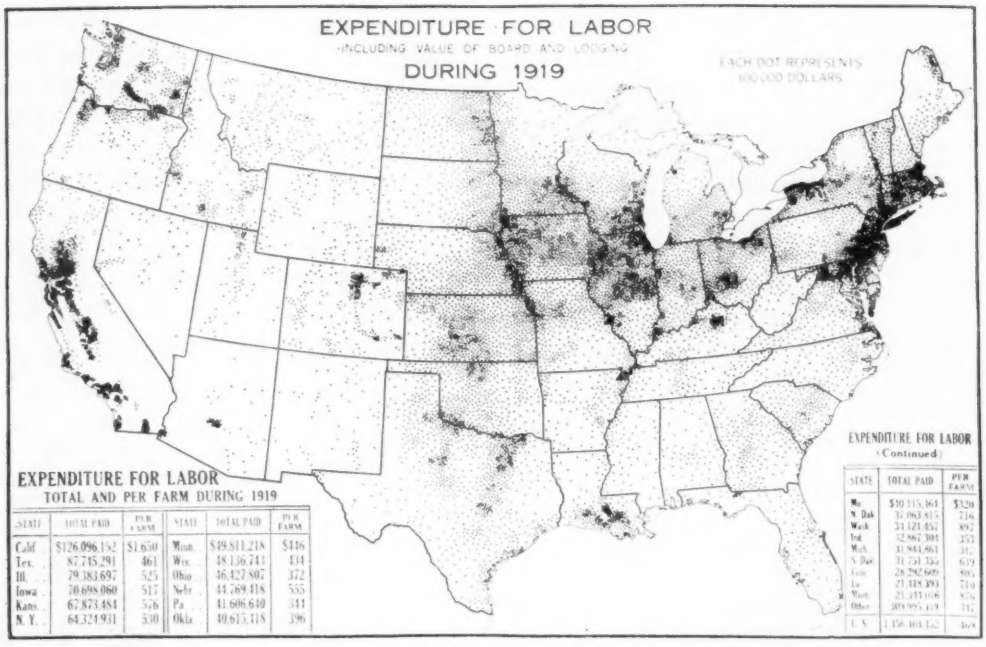

EXPENDITURE FOR FERTILIZER
DURING 1919
EACH DOT REPRESENTS
$100,000
EXPENDITURE FOR FERTILIZER
TOTAL AND PER FARM DURING 1919
STATE | TOTAL PAID | PER FARM | STATE | TOTAL PAID | PER FARM
S. C. | $52,546,795 | $297 | Ala. | $14,066,106 | $80
N. C. | 48,796,694 | 213 | Ohio | 13,206,016 | 80
Ga. | 46,196,434 | 165 | N. J. | 10,742,682 | 472
Va. | 17,277,705 | 128 | Fla. | 10,316,929 | 357
Pa. | 15,628,341 | 108 | Ind. | 8,734,696 | 88
N. Y. | 15,067,371 | 133 | Calif. | 8,182,986 | 497
EXPENDITURE FOR FERTILIZER
(Continued)
STATE | TOTAL PAID | PER FARM
Me. | $7,759,067 | $143
Md. | 7,610,476 | 194
Conn. | 4,893,658 | 386
Mich. | 4,872,543 | 74
Miss. | 4,288,165 | 60
Mo. | 3,941,488 | 83
Mass. | 3,906,733 | 230
La. | 3,840,469 | 102
Ky. | 3,597,449 | 41
Other | 20,926,977 | 74
U. S. | 326,199,800 | 111

FIGURE 184.—The Middle Atlantic Trucking Region ranks next to the Cotton Belt in expenditure for fertilizer; and in expenditure per acre in crops, over $10, exceeds it. In the Connecticut Valley the average expenditure per acre of crops exceeded $25 in 1924, and on tobacco often is $100 an acre or even more. On Long Island the average expenditure per crop acre was $34, but in the North Carolina section only $7. In the entire region the expenditure in 1924 was nearly $40,000,000. This includes expenditure for animal manure and lime as well as commercial fertilizer. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

morning and evening, and 60 to 70 per cent in the afternoon. It is a little higher in summer and winter and lower in spring and fall. This moderate humidity helps to account for the many health resorts along the coast in this region.

Doubtless even more important factors are the lower summer and higher winter temperatures along the moderating influence upon the temperatures in the region, the nearer the ocean, the greater being the influence.

The average summer temperature (June, July, and August) is about 80 degrees at the southern end of the belt and 67 degrees at the northern end, while the average winter temperature (December, January, Feb-



EXPENDITURE FOR LABOR
TOTAL AND PER FARM DURING 1919

STATE	TOTAL PAID	PER FARM	STATE	TOTAL PAID	PER FARM
Calif.	$126,096,152	$1,650	Minn.	$39,811,218	$416
Tex.	87,745,291	461	Wis.	48,136,243	434
Ill.	79,383,697	525	Ohio	46,422,807	372
Iowa	70,698,060	517	Nebr.	44,269,818	555
Kans.	67,873,484	576	Pa.	41,606,640	311
N. Y.	64,324,931	530	Okla.	40,615,118	396

EXPENDITURE FOR LABOR
(Continued)

STATE	TOTAL PAID	PER FARM
Mo.	$39,115,163	$329
N. Dak.	37,063,815	716
Wash.	34,121,452	892
Ind.	32,867,300	353
Mich.	31,941,863	372
S. Dak.	31,721,324	619
Colo.	28,292,669	806
La.	27,318,390	710
Mont.	27,133,016	876
Other	209,995,419	715
U. S.	1,156,161,132	464

FIGURE 185.—The expenditure for labor in the Middle Atlantic Trucking Region was even greater than the expenditure for fertilizer, exceeding $46,000,000 in 1924. This is an average of over $12 an acre for all crop land, and of over $50 an acre for the land in vegetables, potatoes, tobacco, and fruit. It will be noted in the map that there is no other area of such heavy expenditure per square mile of land area as that in New Jersey and southern New England, except the valleys of California, and, possibly, of Oregon and Washington. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

ruary) declines from 50 degrees at the southern end of the region to 25 degrees at the northern end. These are much higher winter temperatures than those at the same latitudes in the interior of the continent. Especially notable is the moderating influence of the ocean on the occurrence of very low temperatures. The lowest temperature ever recorded at Boston is 10 degrees below zero, which temperature has also occurred as far south as central Alabama and southern Oklahoma. Norfolk, Virginia, has never experienced any lower temperatures than Mobile, Alabama. These mild winter temperatures in the region greatly reduce the injury to fruit and the perennial vegetable crops.

The ocean likewise exerts a notable influence upon the occurrence of frost and duration of the frost-free season. The last killing frost in spring occurs on Cape Cod and Long Island about April 20, or at the same time as in extreme northern Georgia; while at Norfolk it occurs about March 20, or at the same time as in south-central Georgia. The fall frost is greatly retarded, occurring on Cape Cod and Long Island about November 1, or at the same time as in north-central Georgia; while at Norfolk, the average date is November 11, and at Georgetown, South Carolina, November 21. As a consequence, the frost-free season on Cape Cod and Long Island is 190 days, which is almost as long as along the northern edge of the Cotton Belt; while in the Virginia and North Carolina portions of the Trucking Region, it ranges from 200 to 230 days (the

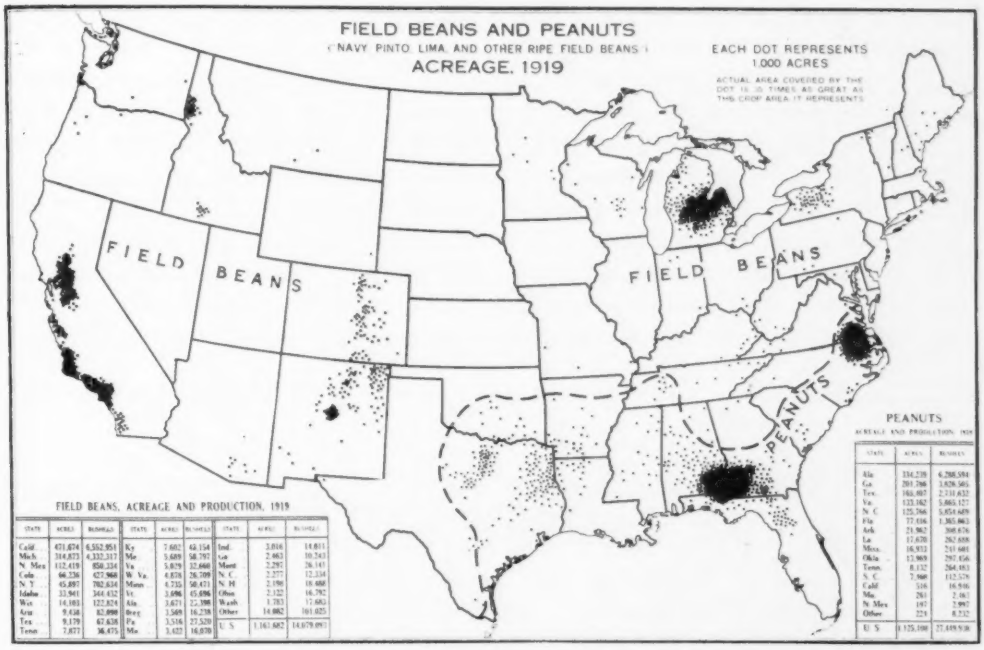

FIELD BEANS AND PEANUTS
(NAVY, PINTO, LIMA, AND OTHER RIPE FIELD BEANS)
ACREAGE, 1919
EACH DOT REPRESENTS
1,000 ACRES
ACTUAL AREA COVERED BY THE DOT IS 25 TIMES AS GREAT AS THIS CROP AREA IT REPRESENTS
FIELD BEANS
FIELD BEANS
PEANUTS
PEANUTS
FIELD BEANS, ACREAGE AND PRODUCTION, 1919

FIGURE 186.—Most of the peanuts roasted and used for food come from the southeastern Virginia-northeastern North Carolina district. Here also are grown some of the peanuts that are made into peanut butter and oil. In the other districts shown on the map, the peanuts are used mostly for feeding hogs, but some are used for making butter. The acreage shown on the map does not include the crop "hogged off" by stock. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

longer period being along the coast). This is as long a frost-free season as in the southern Cotton Belt. The long frost-free season permits the successive production of two or even more truck crops each year on the same land.

Topography

The Middle Atlantic Trucking Region consists mostly of the lower Coastal Plain, which rises more than 100 feet above sea level in only a few small areas. The land is level to gently rolling. Only in northern New Jersey, New York, and southeastern New England, where the region extends slightly onto the Appalachian Uplands, is an appreciable proportion of the land too rough or hilly for crop production. On the contrary, the principal topographic condition limiting the use of the land in the region is poor drainage. There are numerous areas of marshy land along the coast, and an even greater extent of upland which lies so level that drainage is sluggish, and the crops frequently injured as a consequence. This condition is more common in the Virginia and Carolina portions, where there is some silt and clay soil, than in the New Jersey and New England portions of the region, where nearly all the soils are loamy, sandy, or gravelly.

Soils

There are many kinds of soil in the region, but practically all of them require the application of manure or fertilizer in order to obtain profitable crop yields. The expenditure for fertilizer is greater in this region than in any other agricultural region except the Cotton Belt (Fig. 184). This expenditure averaged over ten dollars

per acre in 1924 for the total crop acreage harvested, and constituted one of the largest items in the cost of crop production. Of course, a part of this large expenditure is attributable to the crops grown—vegetables and fruits especially, which it would pay to fertilize even on good soils. Nevertheless, there is no question but that this region, from the standpoint of soils suitable for grain and hay crops, is one of the poorest in North America.

Nowhere else in North America to the same extent, except in parts of the Subtropical Crops Belt, is the soil considered primarily a medium through which to feed the crops. Nowhere else, except in Florida, does the original fertility of the soil play so small a part in crop production. The land in some of the most productive sections of this region supplies little more than sunshine and showers and support for the plant, which is fed fertilizer with a precision based on scientific knowledge and long experience.

It is a shock to a person from the grain-growing or livestock regions of the West to see the poorest kind of sandy land in the tobacco districts of the Connecticut Valley, land that would scarcely be worth $3 an acre for grain or hay production, sell for $300 an acre, because it provides just the proper medium through which to feed a crop of high-grade Sumatra tobacco. Similar soil lying adjacent, but a few inches lower, and with the water-table that much nearer the surface, may have scarcely any value. These contrasts of high prices for developed land and of almost no price for vast areas of seemingly similar soil growing up to brush or forest nearby are characteristic of this Trucking Region.

FIGURE 187.—A field of peanuts with posts set for shocking, near Scotland Neck, North Carolina. Note the sandy character of the soil, and the young stand of pine in the background, probably grown up in an old field. (Photo by H. A. Miller, U. S. Dept. of Agr.)

LAND UTILIZATION

Practically the entire Middle Atlantic Trucking Region, except the

marsh land and the sand dunes along the coast, was originally covered with forest, mostly pine or oak, or both mixed.[1] Despite the fact that this was the first part of North America to be settled by Europeans and that many large cities have grown up within its borders, over 60 per cent of the land area still remains in forest or brush, only 40 per cent is in farms, only 16 per cent is in crops, and scarcely 3 per cent is in pasture. This is a smaller proportion in crops than in the other agricultural regions, except the Subtropical Crops Belt, the Grazing and Irrigated Crops Region of the western deserts, the Forest and Hay Region of Northern Canada and the North Pacific Hay and Pasture Region, which consists mostly of forest-covered mountains. The proportion of the land in pasture is smaller than in any of the agricultural regions, except the Forest and Hay Region of Canada and the North Pacific Coast.

Within an afternoon's walk of several large cities in the Middle Atlantic Trucking Region can be found almost as wild and impenetrable woodland or brush land areas as those existing in the Rocky Mountains. What has caused the forest or brush to extend up to the very edges of the cities in this longest settled and most densely populated of all the agricultural regions? Why is only one-sixth of the land used for crops, whereas five-sixths could be so used, provided it paid to apply fertilizer. Moreover, the trend is toward the use of less land for crops, rather than more. From 1909 to 1924 the area of crops harvested decreased by 230,000 acres, or 6 per cent, and in 1924 there were over 500,000 acres of plowable land lying idle.

FIGURE 188.—Peanuts in the shock, near Chuckatuck, Virginia, piled up around the posts for drying. (Photo by H. A. Miller, U. S. Dept. of Agr.)

The principal reason is to be found in the fact that sandy soils are not well suited to most staple crops, and still less suited to pasturage. A second reason is that the potato and the various vegetable crops to which sandy soils are well suited require a relatively small acreage to produce the quantity which the American

[1] There were many clearings made by the Indians and a small natural prairie (about 50 square miles) near Hempstead, Long Island. (See "The Hempstead Plains, a Natural Prairie on Long Island." R. M. Harper, *Bull. Amer. Geog. Soc.*, 43: 351–360, figs. 1–5, May, 1911).

people consume. The acreage in potatoes, sweet potatoes, and all other vegetables totaled less than 2 per cent of the acreage of all crops in the United States in 1919 (the latest year for which figures are available). In this small Middle Atlantic Trucking Region alone there is enough potentially arable land to raise more than twice the total quantity of potatoes and vegetables produced in the entire United States. Even the tobacco crop, which is very important in two sections of this region, might be added, and the statement would still be true.

It appears certain that most of the land in this Middle Atlantic Trucking Region will remain in forest or brush for many years to come—probably permanently. Whether this land will be producing valuable forest products, or be allowed to remain in gray birch (in New England) or pitch pine (in the southern section), both trees of low value, will depend very largely on state and national land policies. The basic fact which should be realized is that this forest and waste land, despite its proximity to large cities, is not likely to be needed for agricultural use within a century. Meanwhile it may pay to use much of it for the production of lumber and other forest products, and some of it for city and state parks and other recreational purposes.

The Crops

The Middle Atlantic Trucking Region does not produce even its proportionate share, based on population, of the nation's production of potatoes and most other vegetables. It contains about 14 per cent of the nation's population, but only 8 per cent of the nation's acreage of potatoes and less than 12 per cent of the acreage of other vegetables grown for sale, including sweet potatoes. It appears that Maine to the north, California far to the west, and Florida to the south, as well as other remote states, are able to ship potatoes or vegetables vast distances and compete with the products of this region in their own markets. However, most of the California and Florida products arrive in winter and spring when local products are unavailable.

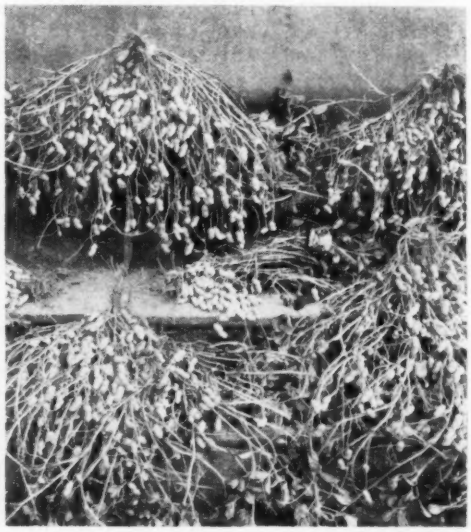


FIGURE 189.—Two varieties of peanuts, hung with roots up to show the nuts (pods) attached to the lower parts of the vines. The small, compact bunches are the Virginia Running variety, and were taken from a field that yielded 100 bushels per acre. (Photo by H. A. Miller, U. S. Dept. of Agr.)

As a consequence of these conditions most of the crop land in the Middle Atlantic Trucking Region is not devoted to potatoes, vegetables, and fruit, but instead to corn and hay. These two crops occupied nearly 2,000,000 acres in 1924, or half of the crop acreage harvested, whereas, the potatoes, sweet potatoes, vegetables, fruits, and tobacco totaled about 900,000 acres. However, although these intensively cul-

tivated crops occupied less than 25 per cent of the total crop acreage, their value constituted nearly 60 per cent of the value of all crops (Table I).

The corn is grown principally in the Carolinas, Virginia, Maryland, and Delaware sections of the region, where it constitutes about one-third of the acreage of all crops. In New Jersey only one-sixth of the crop land is in corn, in Long Island and the Connecticut Valley only one-eighth, and in the southeastern New England section, only one-twentieth.

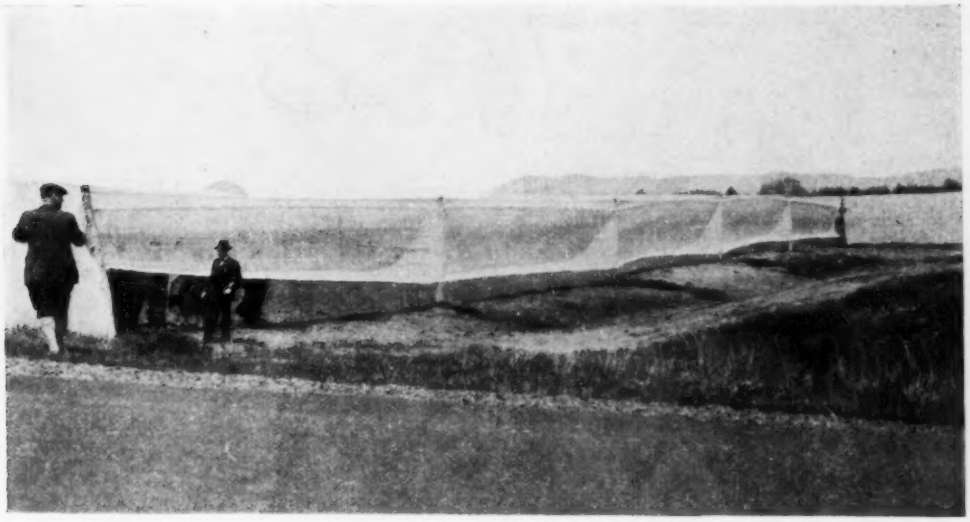


FIGURE 190.—A tobacco field in the Connecticut Valley covered with cheesecloth. The sides as well as the top of the tent are covered to reduce wind pressure and maintain temperature. The Holyoke Range of hills can be seen over the tent in the district. (Photo by Clark University, School of Geography.)

In the southeastern New England section most of the corn is cut for silage; in the Connecticut Valley about half the acreage is for silage, nearly half for grain, and a little for green fodder; on Long Island four-fifths is harvested for grain; and from New Jersey to the Carolinas practically all is cut for grain. The large proportion in New England cut for silage is owing not only to the cooler climate, but also to the large city demand for milk, and the dominance of dairying on the heavier soils.

The yield per acre of corn decreases in the region from north to south. In the New England sections the average acre-yield is over 45 bushels; in New Jersey, about 40 bushels; in the Delaware-Maryland section, about 35 bushels; in the Virginia section, less than 25 bushels; and in the Carolina portion, less than 20 bushels. On the other hand, the acreage per farm increases from north to south. In the New England sections, the average area of corn per farm growing corn is only 4 to 5 acres, whereas in the Virginia and Carolina sections the area per farm averages 8 to 10 acres. In the New Jersey and Maryland sections the average area is 6 to 8 acres per farm reporting corn. Throughout the region, therefore, the average production of corn per farm growing corn, either as grain or silage, is similar in quantity—about 200 bushels or equivalent. But in the eastern

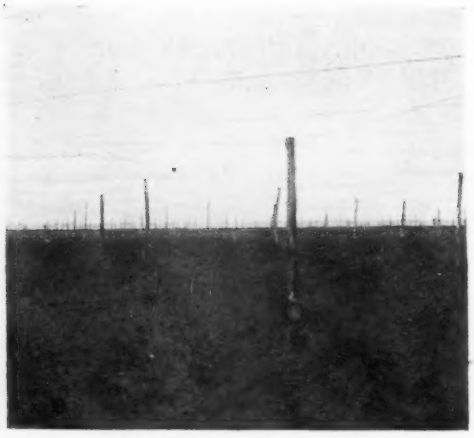


FIGURE 191.—Beneath the tobacco tent shown in Figure 190. The poles are high enough to permit men and horses to work beneath. From the tops of the poles a wire network is strung to support the cheesecloth, which is attached to the wires. The soil has been prepared for the tobacco transplants, but these have not yet been set. (Photo by Clark University, School of Geography.)

Massachusetts section, only one-fifth of the farms grow corn, in the Connecticut Valley only about one-half, whereas in the Virginia and Carolina portions, fully 90 per cent of the farms grow corn. It is this greater proportion of the farmers who grow corn that explains the much greater production in the southern sections of the region.

The hay, conversely, is grown mostly in the northern portion of the region. It constitutes about 80 per cent of the acreage of all crops in the southeastern New England subregion, nearly 60 per cent in the Connecticut Valley, but only 20 per cent in New Jersey, 13 per cent in Delaware, and less than 10 per cent in the Maryland, Virginia, and Carolina sections of the Region. The hay crops are mostly timothy, timothy and clover mixed, the bent grasses, red top and orchard grass in New England; timothy and clover, grown separately or mixed, in New Jersey and Delaware, with a little alfalfa; while in the Maryland, Virginia, and Carolina sections, the annual legumes, i.e., cow-peas, soy-beans, and peanuts, become the dominant hay crops.

In southeastern Virginia and northeastern North Carolina the peanuts are grown for the nuts. This is the greatest peanut-producing center in North America (Figs. 186–189). On the silt soils adjoining Albemarle Sound in North Carolina, soy-beans for grain have become an important crop. Very few cow-peas are grown for seeds in the Middle Atlantic Trucking Region.

The tobacco is grown in the Connecticut Valley and in the Carolinas. The Connecticut Valley crop is mostly (five-sixths) of the broad-leaf, cigar binder type, half of which is grown from Havana seed; but the small amount (one-sixth) that is shade-grown Sumatra wrapper is worth nearly as much since its price per pound averages four to five times that of the binder leaf. This very highest grade Sumatra tobacco is grown under vast tents made of cheesecloth (Figs. 190-192). The shading results in a thinner leaf with less "gum," and also moderates changes in the temperature, while preventing damage by wind and hail. Much of this shade-grown tobacco is produced by corporations operating with large amounts of capital, and nowhere in the world is tobacco production carried on with a higher degree of skill and technical knowledge. The tobacco grown in the Carolina section of the Region is of the bright flue-cured type, and although twice as large quantity is usually produced in this southern district as in the Connecticut Valley, the value of the crop is only about a half greater than in the much smaller northern district.

Tobacco is a crop that requires a large amount of labor; consequently, the acreage per farm is small, except among the Sumatra wrapper producing corporations of the Connecticut Valley. In the entire Connecticut Valley district the average area in tobacco per farm is 8 acres, but in the Carolina district it is only four to five acres. On the other hand, in the Connecticut Valley the tobacco occupies nearly one-third of the improved land of tobacco farms, whereas in the Carolinas, it occupies only one-sixth. In the Connecticut Valley much of the land grows tobacco year after year, and the very high yields are maintained by heavy applications of fertilizer and manure. In the Carolinas there is usually an alternation of one or more years in tobacco, and then resting the land for one or more years, sometimes clearing up the forest in order to obtain unexhausted soils. Now, however, the use of commercial fertilizer is being rapidly extended.

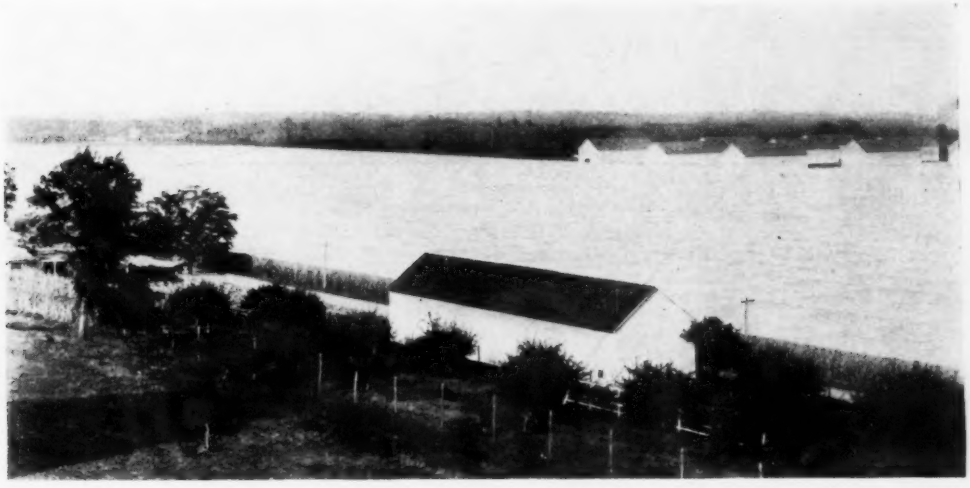


FIGURE 192.—The growing of high-grade cigar wrapper leaf from Cuban seed under an artificial shade of cheesecloth or of slats is an outstanding recent development of cigar tobacco production The field covered with cloth here shown is 1¼ miles long. (Photo from W. W. Garner, Bur. of Plant Industry.)

The vegetable crops occupy a relatively small acreage in the region, but owing to their high value per acre, the aggregate value of these crops far exceeds that of any other crop. There were about 210,000 acres of vegetables grown in the Region in 1924,[2] of which nearly one-half was in the New Jersey section; over one-fourth in the Delaware, Maryland, and Virginia section; one-sixth in the New England and Long Island sections; and only about one-twenty-fifth, or 8,000 acres, in the Carolina section. This Carolina section is included in the region because it is not part of the Cotton Belt, and because the similarity of the physical conditions to those in the region to the north, as well as the rapid development of the trucking industry, indicates that the vegetable crops will eventually become dominant in this section of the region

[2] Only seven vegetables were reported in the 1925 census of agriculture and their total area harvested in the region was 158,600 acres. But, these vegetables constituted about three-fourths of the acreage of all vegetables in 1919, and it has been assumed that this same ratio existed in 1924.

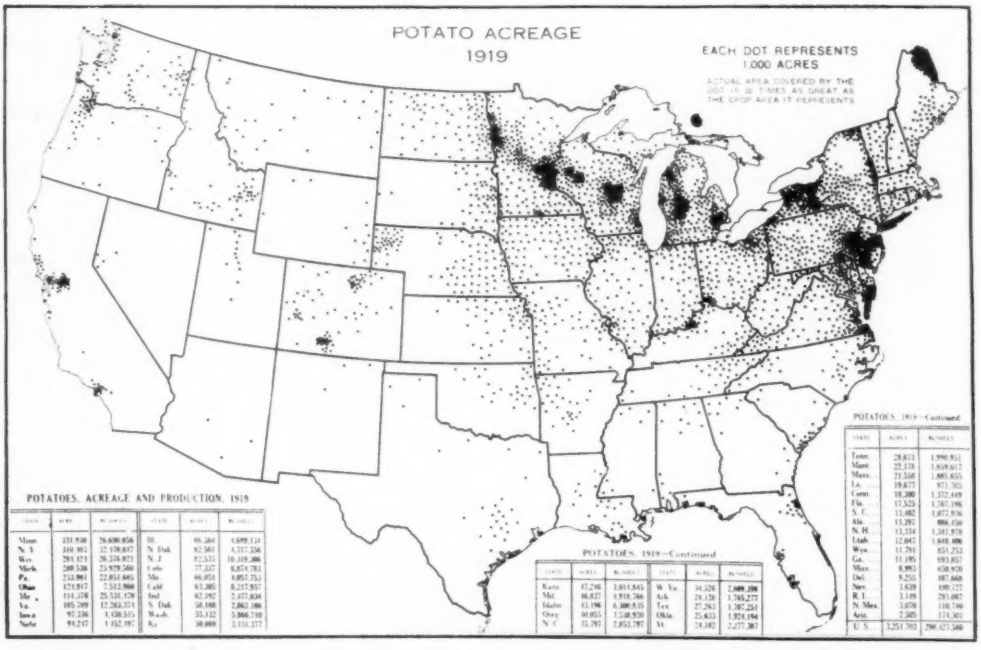
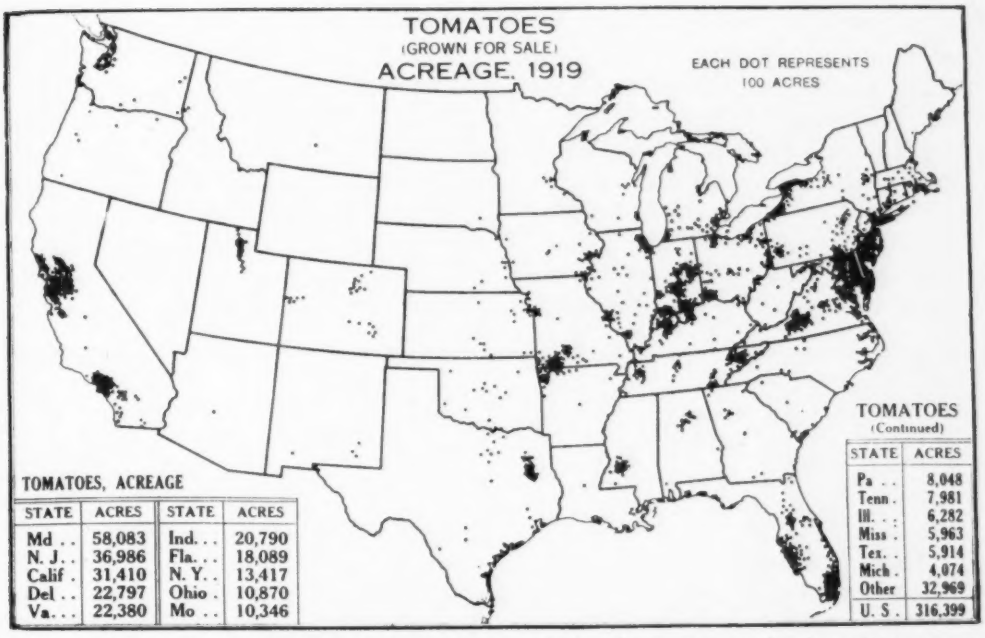


FIGURE 193.—Three of the most important potato-producing districts in North America are located in the Middle Atlantic Trucking Region, the Norfolk-Eastern Shore district of Virginia and adjacent Maryland, the Monmouth County and southwestern district in New Jersey, and the Long Island district, except that farmers in the Long Island district in a season when the price of early potatoes is low, often let the crop grow full size and harvest the potatoes in the fall as part of the nation's late crop. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

also. Meanwhile the dominance of tobacco, an intensively cultivated crop, results in a system of farming resembling that of trucking.

The leading vegetable crop in the southeastern New England section is the potato, followed by sweet corn, cabbage, tomatoes, lettuce, and celery (Figs. 193, 194, and 195). In the northern portion of the Connecticut Valley, one of the largest onion-producing districts in the United States is located. On Long Island also the dominant vegetable crop is the potato, followed by sweet corn, with cabbage a close third, and tomatoes much less important. In the New Jersey section, potatoes are again dominant, especially in the central portion, but tomatoes rank second, the acreage being more than twice that of sweet corn, while peppers, asparagus, cabbage, muskmelons, lettuce, onions, green beans, green peas, and celery follow far behind. In the southernmost counties of New Jersey, watermelons also become an important crop. In the Delaware and Maryland sections, tomatoes and melons are the all-important crops, with potatoes becoming dominant in Worcester county, Maryland. Southern New Jersey, Delaware, and eastern Maryland constitute much the greatest tomato-producing area in the United States. Sweet corn, green peas, green beans, and cucumbers are also raised in large quantities. In the Virginia section of the region, the acreage of potatoes is four times that of sweet potatoes and ten times that of all other vegetables. Among these other vegetables cabbages are the leading crop, with



TOMATOES, ACREAGE

STATE	ACRES	STATE	ACRES
Md . .	58,083	Ind. .	20,790
N. J. .	36,986	Fla. . .	18,089
Calif .	31,410	N. Y. .	13,417
Del . .	22,797	Ohio .	10,870
Va. . .	22,380	Mo . .	10,346

TOMATOES
(Continued)

STATE	ACRES
Pa . .	8,048
Tenn .	7,981
Ill. . .	6,282
Miss .	5,963
Tex. .	5,914
Mich .	4,074
Other	32,969
U. S .	316,399

FIGURE 194.—The eastern Maryland, Delaware, and New Jersey tomato district, which extends into tide-water Virginia on the south and Long Island on the north, is by far the greatest tomato-producing area in North America, if not in the world. This area includes about one-third of the total acreage in the United States, and the Los Angeles and San Francisco Bay districts in California about one-tenth. Tomatoes lead all the vegetables grown for sale in the United States (other than potatoes and sweet potatoes), both in acreage and value. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

tomatoes, sweet corn, spinach, onions, melons, green beans, and cucumbers becoming important locally. In the Carolina section potatoes and sweet potatoes are the leading vegetable crops; watermelons, muskmelons, and cabbages are quite important in several localities. There is a large lettuce, beet, and cucumber producing district near Wilmington and a strawberry district around Chadbourne, North Carolina.

Pasture

Pasture is of more importance in the northern portion of the Middle Atlantic Trucking Region than in the southern, but it is nearly everywhere of small importance compared with its position in the Hay and Dairying Belt, or the Corn Belt. In the southeastern New England sub-region 7 per cent of the farm land was plowable pasture and 9 per cent was unplowable pasture, whereas over a third of the farm land was in harvested crops in 1924. In the Connecticut Valley, pasture is more important than elsewhere in the region. In this Valley 9 per cent of the farm land is plowable pasture and 13 per cent is nonplowable pasture, or 22 per cent in all, compared with 43 per cent in crops. But the product of the crop land is probably worth 25 times that of the pasture land. In Long Island and to the south, pasture sinks into insignificance, the total acreage (excluding woodland pasture) amounting to less than 5 per cent of the farm land in all sections, except in the New Jersey section (where it averages 9 per cent). In the Carolina section, 2 per cent of the land is cleared pasture, and 2 per cent more is classified as woodland

pasture which, however, has a very low carrying capacity. In no other part of the United States or Canada does pasturage sink into such insignificance. This is owing mostly to the generally sandy soil.

Livestock

The principal classes of farm animals in the region are horses and mules, cattle, swine, and poultry. The horses are found throughout the region, but the mules are practically confined to the sections south of the Delaware River. In the Carolina sections of the region, mules outnumber the horses two to one, while in the Virginia, Maryland, and Delaware section the number of horses and mules is nearly equal. The total horse power available in the horses and mules "two years old and over" was about 275,000 on January 1, 1925, 60 per cent supplied by horses and 40 per cent by mules. In addition, there were 9,500 tractors in the region, which would possess a rated horse power of about 95,000. But, the substitutional value for horses and mules may not be over half as much. It may be estimated, therefore, that there were about 325,000 mature horses and mules, or equivalent, available for plowing and cultivating the 3,750,000 acres of harvested crop land, which gives an average of about 11 acres of crop land per horse power.

The number of tractors appears likely to increase and horses to decrease, as there were less than 2,000 colts under two years old in the entire region—scarcely more than one-twentieth as many as are needed to replace the horses and mules that die annually, or become unfit for labor. Undoubtedly work horses will con-

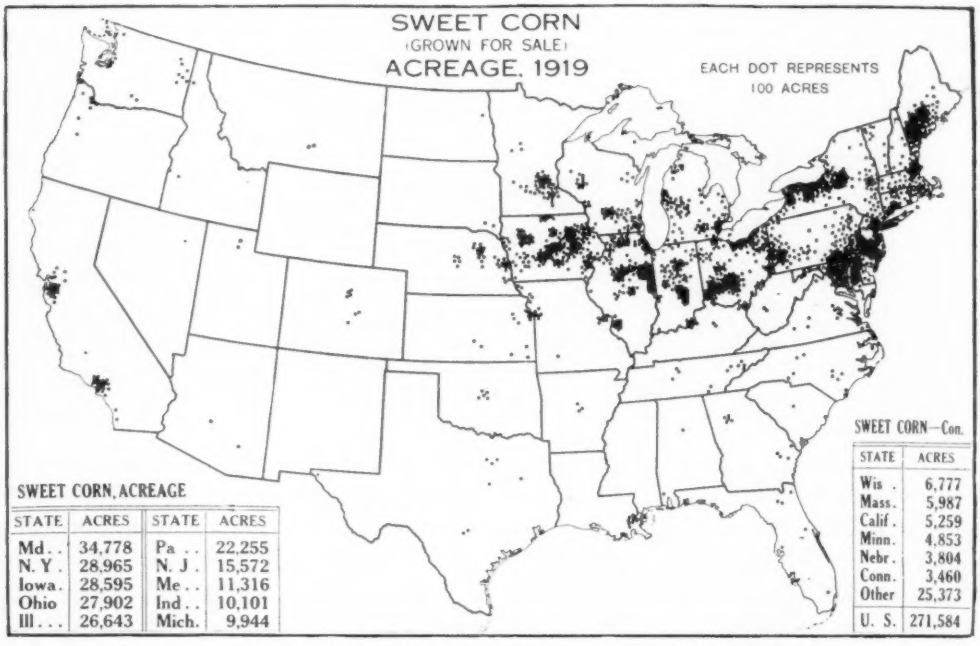

SWEET CORN
(GROWN FOR SALE)
ACREAGE, 1919
EACH DOT REPRESENTS
100 ACRES
SWEET CORN, ACREAGE
STATE | ACRES | STATE | ACRES
Md.. | 34,778 | Pa .. | 22,255
N. Y. | 28,965 | N. J. | 15,572
Iowa. | 28,595 | Me.. | 11,316
Ohio | 27,902 | Ind.. | 10,101
Ill... | 26,643 | Mich. | 9,944
SWEET CORN—Con.
STATE | ACRES
Wis . | 6,777
Mass. | 5,987
Calif. | 5,259
Minn. | 4,853
Nebr. | 3,804
Conn. | 3,460
Other | 25,373
U. S. | 271,584

FIGURE 195.—One of the largest sweet corn producing districts in North America is located in southern New Jersey, and two other still larger districts lie just outside the Middle Atlantic Trucking Region—in eastern Maryland and in southern Maine. Almost no sweet corn is grown, however, in the Virginia and Carolina sections of the region. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

tinue to be shipped in from the West, but as the United States as a whole has only about half as many colts as are needed to replace the horses and mules that die annually, it appears that the supply cannot continue as abundant as in years past.

Cattle are raised throughout the region, from one-half to two-thirds of the farms, varying with the county, reporting cattle, according to the census. In the northern portion, the cattle are kept mainly for milk production, and in the southern portion, mainly for beef. About 80 per cent of the cattle are milked in the New England sections, 65 per cent in the Delaware, Maryland, and Virginia section, and only 38 per cent in the Carolina section. Moreover, the production of milk per cow was about 640 gallons per head in New England sections, but only 324 gallons in the Delaware, Maryland, and Virginia section, and about 290 gallons in the Carolina section, according to the census returns for 1924. The value of dairy products, mostly milk, amounted to over $20,000,000 in the New England sections of the region, to $7,500,000 in the New Jersey section, to $2,000,000 in the Delaware, Maryland, and Virginia section, and to less than $1,000,000 in the Carolina section, although this Carolina section has more than twice the aggregate area of the New England sections, and twice as many farms. Unfortunately, no data are available on the production of beef, but it probably did not exceed $1,000,000 farm value in the Carolina section in 1924. In the New England sections, the value of dairy products averaged about $900 for every farm reporting cows milked

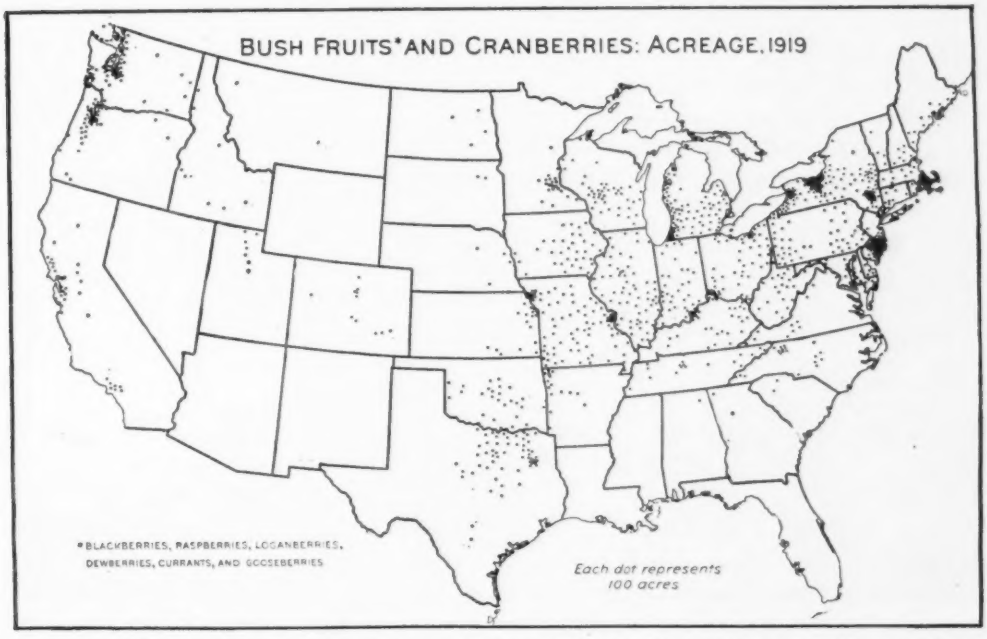

BUSH FRUITS*AND CRANBERRIES: ACREAGE.1919
*BLACKBERRIES, RASPBERRIES, LOGANBERRIES, DEWBERRIES, CURRANTS, AND GOOSEBERRIES
Each dot represents 100 acres

FIGURE 196.—The dense production shown in Cape Cod and adjacent Plymouth County, Massachusetts, is almost wholly cranberries. This is the greatest cranberry district in the world. The dense production shown in New Jersey is mostly cranberries, but also includes raspberries and blackberries. (Map from 1921 Yearbook, U. S. Dept. of Agr.)

(as compared with $250 for the United States as a whole), whereas in the Carolina section of the region the value of both dairy products and beef produced per farm reporting cattle was only about $50. However, it must be recalled that the development of dairying in the northern portion of the region is owing primarily to the local market for fresh milk provided by the many large cities, and that the feed out of which milk is made comes partly from the Corn Belt and other western regions.

Chickens and hogs are also important farm animals in the region. Indeed, the value of chickens raised and eggs produced considerably exceeds the value of dairy products. The chicken industry, like the dairy industry, and for the same reasons, is much better developed in the northern portion of the region, while the hogs are found mostly in the southern portion. The farm value of eggs produced and of chickens raised in 1924 exceeded $15,000,000 in the New England sections of the region, and was nearly $15,000,000 in the New York and New Jersey sections, but totaled less than $7,000,000 in the Delaware, Maryland, and Virginia section and only $4,000,000 in the Carolina section. On the other hand, there were less than 100,000 hogs in all that portion of the region north of the Delaware River, and over 500,000 hogs in the portion south of that river. In the Carolina section, the value of the hogs raised probably averaged $70 per farm. The farm value of the hogs produced in the entire region in 1924 probably did not exceed $8,000,000, while the farm value of the eggs and chickens raised exceeded $40,000,000. These chickens, however, like the dairy cows, were fed largely on grain and mill feed from the Corn Belt and wheat regions far to the west; and, despite the importance of the poultry industry in the region, it did not supply even half of the eggs and chickens consumed by the population living in the region. But 80 to 90 per cent of all farms report poultry, and the value of poultry produced per farm having poultry was about $500 in the New England section, and averaged about $300 for the entire region in 1924. The average for the United States is only $180. It is evident

FIGURE 197.—A potato field in Monmouth County, New Jersey, showing, beyond, a typical farmhouse and barns. (Photo by G. A. Billings, formerly of U. S. Dept. of Agr.)

FIGURE 198.—Harvesting potatoes with a mechanical digger in New Jersey. Note the pipes on posts for overhead irrigation, probably for the preceding crop, however, rather than for the potatoes. (Photo from Bur. of Agr. Economics, U. S. Dept. of Agr.)

that the production of dairy and of poultry products per farm in much of the region considerably exceeds the average for the United States. In the New England section, the production of animal products averages over $1,000 per farm.

SYSTEMS OF FARMING AND SIZE OF FARMS

The dominant system of farming in most of the region is the production of potatoes, vegetables, and small fruits for shipment to the large city markets. But, as already indicated, there are other systems of farming of considerable importance in different portions of the region—peach growing in New Jersey, Delaware, and Southern New England; tobacco production in the Connecticut Valley and in the Carolina section of the region; dairying, and also poultry production, in practically all the northern portion of the region; and the production of hogs and a few beef cattle in the Virginia and Carolina sections. Although these systems of farming are not wholly exclusive, a milk cow or two and a number of chickens being found on nearly every farm in the northern portion of the region, and a few hogs and cattle on nearly every farm in the southern portion, these farming systems are as distinct, perhaps, as they are anywhere in the United States. Their geographic distribution and characteristics have been noted already in a general way, but it is desirable to mention more fully some of the characteristics of the truck farms.

Trucking

In the New England sections of the region, there are farms primarily devoted to potatoes, others to onions, and others to the production of several kinds of vegetables, but that most of the potatoes are grown on farms having other crops is indicated by the fact that one-third to two-thirds of all farms report potatoes, varying with the county, and that the average area of potatoes grown for sale per farm reporting same in the census is less than one acre. The onion farms, located mostly in the Connecticut Valley, average about three and one-half acres of onions per farm. In many farms in the Valley onion production is merely one enterprise on farms devoted primarily to dairying or tobacco, consequently many farms have a smaller acreage than this, and some farms a much larger acreage. Less than one-third of the farms in this New England section of the region produce "other

FIGURE 199.—Hauling potatoes to market on the eastern shore of Virginia. Note the two-wheeled cart drawn by a mule, the wagons drawn by two horses, and the two auto-trucks. (Photo by B. E. Shaffer.)

vegetables" for sale and the average area in such "truck" crops is about three acres per farm. That different farms specialize in different crops is indicated by an acreage area of two acres in asparagus per farm growing this crop for sale, one acre in cabbage, one acre in carrots, two acres in celery, one and a half acres in sweet corn, which is grown by about half the truck farmers, two-thirds of an acre in cucumbers, one acre in lettuce, one acre in tomatoes, etc., and two acres per farm growing mixed vegetables. Since many farmers who have only a small patch report vegetables sold, it is evident that the average acreage of truck crops on the real truck farms considerably exceeds the four acres average just indicated.

However, the acreage of truck crops, including potatoes, is small compared with the total crop acreage in these New England sub-regions, amounting to only about 7 per cent in the coastal sub-region and to less than 9 per cent in the Connecticut Valley. In the coastal sub-region, hay constitutes 80 per cent of the acreage of all crops, and in the Connecticut Valley 56 per cent, which, from the acreage standpoint, would justify placing both these areas in the Hay and Dairying Belt, especially as dairy products possess a greater value than the value of the truck crops. But, after the value of the cranberry and other fruit crops is added to the value of the truck crops in the coastal region, and the value of the tobacco is added in the Connecticut Valley, the combined value exceeds that of dairy products in both sub-regions, and this despite the fact that much of the feed for the dairy cows is brought in from the West. It was on this basis of value, and because the soil conditions indicate that the trend will be toward truck and small fruit crops rather than dairying, that these New England areas were classified with Long Island, Southern New Jersey, and the

coast to the south in the Middle Atlantic Trucking Region.

The most important cranberry district in North America, if not in the world, is located in Plymouth and Barnstable counties, Massachusetts. This is known as the Cape Cod District, though the greatest production now is no longer on Cape Cod, but in southern Plymouth County. The producing bogs covered 7,000 acres, according to the census of 1919, and produced nearly 23,000,000 quarts, having a value of nearly $2,000,000. Although nearly a thousand farmers reported cranberries, most of the production came from a few large growers (Fig. 196).

On Long Island and in New Jersey, potatoes are a more important crop than in southeastern New England and the Connecticut Valley. Indeed, Suffolk County, New York, and Monmouth County, New Jersey, are two of the leading potato-producing counties in the United States (Figs. 197–200). On Long Island the average farm growing potatoes for sale has 20 acres, and in the New Jersey section of this region, the average ranges, in the several counties, from 5 to 15 acres per farm. Sweet potatoes also become an important truck crop in southern New Jersey, and the average area per farm is 3 to 6 acres. Among the other truck crops, tomatoes lead; indeed, the acreage of tomatoes in the state is now three times that of sweet potatoes and two-thirds as great as that of potatoes. Three-fourths of the farms producing other vegetables than potatoes grow tomatoes, and these farms average over four acres per farm (Figs. 201–204).

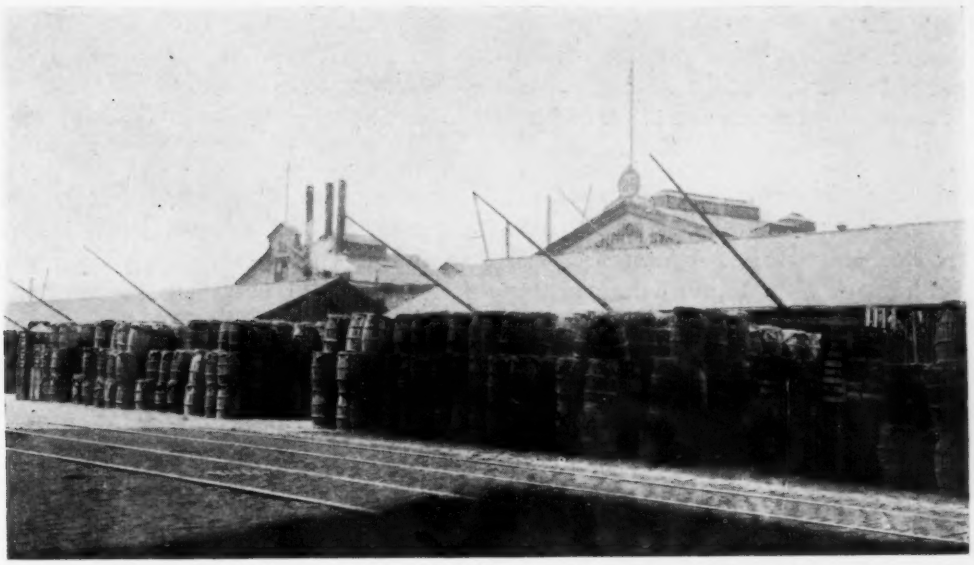


FIGURE 200.—Barrels of potatoes, each with burlap over the top, piled in front of the wharves, New York City, which is the principal market for the Middle Atlantic Trucking Region. (Photo by F. P. Downing.)

The next most important truck crop in New Jersey is sweet corn, which averages nearly 4 acres per farm, and other important crops are asparagus, green beans, cabbages, celery, muskmelons, lettuce, onions, green peas, and peppers. Fully two-

FIGURE 201.—Tomato plants in cold frames ready to be transplanted to the field. (Photo by W. C. Funk, U. S. Dept. of Agr.)

thirds of the farms in the New Jersey section of the Middle Atlantic Trucking Region grow one or more of these truck crops for sale, and the average area per farm is 8 acres. As many of these truck farmers grow also potatoes or sweet potatoes, it is probable that the average area of truck crops per farm, including potatoes, is 15 to 20 acres.

Since the average area of crops per farm for all farms in this New Jersey section of the region is only 33 acres, it is evident that half or more of the crop land in truck farms is in truck crops; and since the acreage in hay is almost equal to that in all the truck crops, including potatoes, and the acreage in corn is fully two-thirds as great, it is evident that on the farms

FIGURE 202.—A field of tomatoes being picked near Swedesboro, New Jersey. The tomatoes are gathered in baskets ready to be carried to the temporary packing house in the distance. Note the level land, the characteristic red cedar trees and the large oaks. (Photo by G. A. Billings, formerly of U. S. Dept. of Agr.)

that do not grow truck crops, the acreage of hay and corn must be quite large. It is mostly on these farms that the dairy cows and chickens are found.

In southern New Jersey, the peach industry is also important. In Burlington County the 1,000 farms reporting peach trees averaged nearly 1,000 trees per farm, and produced nearly 1,000 bushels per farm. Since many farms having only a few trees are included, it is evident that there are some farms having several thousand trees. The peach district extends southward almost to the Delaware River. This is the most important peach-producing district in the United States outside of California and Georgia.

In southern New Jersey there is also an important cranberry district, the acreage of producing bogs, according to the census of 1919, being almost as large as in the Massachusetts district, but the production in that year only a third as great. The average area per farm reporting was 23 acres.

In the Delaware and Maryland section of the Middle Atlantic Trucking Region, the systems of farming and acreage of truck crops per farm are similar to those in New Jersey, but tomatoes become even more important, constituting over half the acreage of vegetables grown for sale after potatoes and sweet potatoes are excluded. In this section over half of all the farmers grow tomatoes and the average area per farm is nearly 4 acres. Half of the farmers grow potatoes, averaging 3 acres per farm. Muskmelons are also a very important crop in several counties in this section (Fig. 208). The combined acreage of potatoes and vegetables averages about 15 acres per farm.

FIGURE 203.—Packing tomatoes in 20-quart standard crates near Swedesboro, New Jersey. (Photo by G. A. Billings, formerly of U. S. Dept. of Agr.)

Since all the farms in this Delaware and Maryland section of the region average only 30 to 35 acres of crops per farm, it appears that over half, perhaps three-fourths, of the crop acreage of the truck farms is in truck

crops. But, since the truck crops comprise less than 20 per cent of the total acreage in crops, the acreage of corn being more than twice and of hay two-thirds as great, it is evident that the farms which do not grow truck crops have a large acreage of corn, hay, and other crops. It is on these farms, principally, that the cattle and hogs are produced.

The Virginia section of the region, principally Accomac and Northampton Counties, together with Worcester and Somerset Counties, Maryland, constitute the largest early potato-producing district in North America. The area in potatoes in this district in 1924, according to the census, was about 100,000 acres, and the production totaled 16,000,000 bushels, an average of 11 acres and 1,760 bushels per farm reporting. Most of the potatoes were grown on farms having a larger acreage than this average. In this Virginia section there were also 20,000 acres of sweet potatoes and over 10,000 acres of other vegetables, nearly half of which was cabbage, and the remainder onions (in Accomac County), tomatoes, melons, and many other vegetables. The average area in cabbages per farm reporting was 4 acres.

Part of the early vegetables from the "Eastern Shore" and "Norfolk" areas are shipped by water to New York, Philadelphia, Baltimore, and Washington, but even more goes by rail, the Pennsylvania Railroad having a double-track, main line and many branch lines traversing the "Eastern Shore" area.

The Carolina section of the region has developed only slightly as yet as a trucking area. Although the land area is over twice as great as the total of the Delaware, Maryland, and Virginia section, and three times that of the New Jersey section, this Carolina section had, in 1924, only about one-fourth as large acreage in potatoes and vegetables as either of the two areas to the north. However, the vegetable acreage in this Carolina section is increasing rapidly. The principal truck crop is the potato. The acreage of sweet potatoes is even larger, but as these are grown largely for local use, the commercial crop is probably smaller than that of the

FIGURE 204.—Shipping tomatoes in crates at Swedesboro, New Jersey. Eighty cars per day are packed and forwarded at the height of the season. (Photo by G. A. Billings, formerly of U. S. Dept. of Agr.)

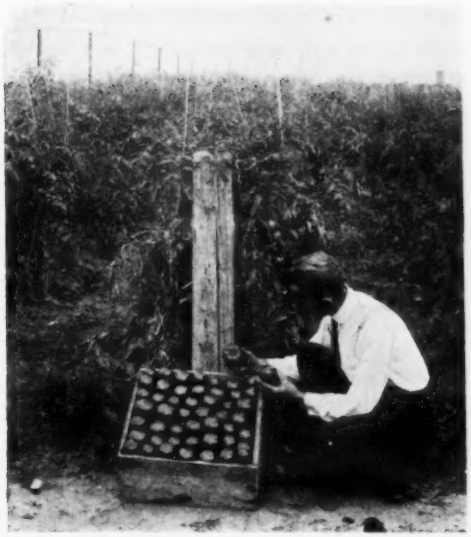


FIGURE 205.—Tomatoes on the farm of William Proctor, Fitchburg, Massachusetts. The plants are grown in a greenhouse in 6-inch pots, then set out, 10,000 to the acre, in double rows, and trained to stakes. The return averages 50 cents per plant, ranging from $4,000 to $6,000 per acre according to the season. This is about the maximum return per acre for any vegetable crop in the United States. Local manure is used freely. The tomatoes are closely graded and sold on the farm to the better class of stores, who send auto trucks from as far as Springfield, Massachusetts, direct to the farm. When tomatoes were selling for $1.20 per bushel in Baltimore, Mr. Proctor was getting $3.50 to $4.50 at his door. (Photo by W. R. Beattie, U. S. Dept. of Agr.)

white potato. Much less important are watermelons, cabbages, lettuce, and muskmelons. The average area per farm reporting is 5 acres for potatoes, 2 acres for sweet potatoes, and 1 to 2 acres for each of the other vegetable crops.

These Carolina truck crops are earlier than those from Virginia and Maryland, but as the Carolinas are also farther removed from the northern markets, the freight rates are higher. Consequently, when the Virginia and Maryland crops come onto the markets, shipments from the Carolinas quickly diminish. The three principal trucking districts in the Carolina section are in northeastern North Carolina, which is almost a part of the Norfolk, Virginia district, the Pamlico Sound district, and the Wilmington district. The digging of early potatoes begins in the Wilmington district about the middle of May, in the Pamlico district by May 20, but in the Norfolk district not until about June 1, and in the New Jersey district not until July 1. These North Carolina districts have, therefore, about two weeks in which to ship potatoes before the Norfolk district starts shipping, but the Norfolk district has almost a month before New Jersey potatoes come onto the market. By July 10 Long Island potatoes may be dug, but if the price of early potatoes is low, these Long Island potatoes will be left to grow till fall, when they will be sold as a part of the late potato crop. One of the principal objects of truck growers in the Middle Atlantic Trucking Region, especially in the southern portion, is to get the crop onto the market as early as possible in order to secure the highest prices.

It is worthy of note that the potatoes grown in the "Eastern Shore" and "Norfolk" districts are marketed largely through a coöperative organization, which receives daily reports on arrivals of potatoes and prices in all the principal markets, and then directs its shipments so as to avoid glutting any market. Over $11,000,000 worth of products, mostly potatoes, were sold through coöperative associations in this section of the Trucking Region during 1924, according to the census. The tobacco of the Connecticut Valley is also sold largely through coöperative associations, the value of such sales exceeding $10,000,000 during 1924.

Although in a region like the

Middle Atlantic Trucking Region, where there are several systems of farming, some very intensive, others extensive, with consequent wide variations in the acreage per farm, it may be even more misleading than usual to give figures of average size; nevertheless, it does appear worth while, with this word of warning, to provide figures on the average acreage of farm land and crop land per farm, value per acre of the land, and expenditures in the several sections of the region. This is done in Tables I and II. It will be noted that the acreage of crops harvested per farm, which is a much better criterion of size than total farm land, varies only from 18 acres in the southeastern New England section to 27 acres on Long Island. Plowable pasture varies from 5 acres per farm in the Connecticut Valley to less than 1 acre in the Carolina section, and "other pasture" from about 9 acres per farm in the southwestern Connecticut-suburban New York section to one-third acre on Long Island.

TABLE I

LAND UTILIZATION IN THE MIDDLE ATLANTIC TRUCKING REGION, 1924, BY SUB-REGIONS OR SECTIONS, AND VALUE OF PRINCIPAL CROPS, 1919

	Land Area	Farm Land		Crops Harvested		Pasture in Farms (Excluding Woodland Pasture)			Value of Land and Buildings, 1925		
	(Approximate Acreage)	Total Acres	Per Farm	Total Acres	Per Farm	Total Acres	Plowable per Farm	Not Plowable per Farm	Total Value	Per Farm	Per Acre
Southeastern New England	3,353,952	1,271,712	54	425,532	18	197,907	4	4	$173,243,183	$7,380	$52
Connecticut Valley	888,448	529,193	51	197,408	19	114,380	5	6	104,366,773	10,092	117
Parts of New Haven and Fairfield Counties, Conn., and Westchester and Rockland Counties, N. Y.	901,984	328,375	62	112,228	21	72,698	4	9	100,137,479	18,887	111
Long Island	878,720	160,893	50	89,797	28	7,813	2	(Less than 1/3 acre)	96,451,467	29,963	110
New Jersey Section	3,334,400	1,174,657	55	709,655	33	112,174	3	2	193,280,266	9,031	58
Delaware, Maryland and Virginia Section	4,238,720	2,678,464	80	845,891	25	96,435	2	1	157,540,153	4,718	37
North and South Carolina Section	10,602,240	4,251,377	62	1,366,758	20	101,066	1	1	196,574,285	2,877	18
Total or ave.	24,198,464	10,394,671	63	4,358,341	26	702,473	2	2	$1,021,593,606	$6,174	$42

	Acreage of Principal Crops, 1925						Approximate Value of Principal Crops, 1919			
	Total Corn	Total Hay	Seven Vegetables	Potatoes	Sweet Potatoes	Fruits (1919)	All Crops	Hay and Forage	Potatoes and Vegetables	Fruits and Nuts
Southeastern New England	21,260	331,391	12,263	9,636	.....	50,267	$30,874,236	$11,496,301	$10,595,993	$7,218,614
Connecticut Valley	25,109	105,726	7,012	6,635	.....	16,543	30,455,339	6,194,707	4,205,712	1,517,767
Parts of New Haven and Fairfield Counties, Conn., and Westchester and Rockland Counties, N. Y.	10,957	74,610	4,411	3,144	.....	11,921	8,054,727	2,576,228	2,679,957	1,514,834
Long Island	11,013	8,566	10,393	40,085	.....	3,788	21,554,809	808,272	18,527,494	350,519
New Jersey Section	121,761	151,975	75,986	58,950	12,425	78,816	69,107,647	8,363,734	38,237,209	10,782,249
Delaware, Maryland and Virginia Section	324,097	80,529	42,908	102,400	28,450	36,808	90,063,314	5,540,563	46,289,911	3,441,798
North and South Carolina Section	530,753	136,446	5,653	22,001	27,701	12,497	154,744,090	2,834,025	13,205,519	1,348,516
Total	1,044,950	889,243	158,626	242,851	68,576	210,640	$404,854,162	$37,813,830	$133,741,795	$26,174,297

The value of farm land and buildings per acre was highest in the Connecticut Valley, about $200 on January 1, 1924, and lowest, $46, in the Carolina section. In the southeastern New England section, the value of the buildings was greater than the value of the land, whereas in the Carolina section, the buildings were worth only a third as much as the land. The farms averaged highest in value on Long Island, $30,000, but this is doubtless owing partly to prospective urban use for much of the land. In the Connecticut Valley, which is probably the richest agriculturally of the sections, the average value of land and buildings per farm was about $10,000, whereas, in the Carolina section, it was less than $3,000. Cash expenditure for labor per farm was greatest on Long Island, over $1,250, and least in the Carolina section, about $40. Expenditure for feed was over $1,100 per farm on Long Island, and less than $20 in the Carolina section. Expenditure for fertilizer was nearly $1,000 per farm on Long Island, and nearly $600 in the Connecticut Valley, but only $150 per farm in the Carolina section. The cash expenditure for these three items, labor, feed, and fertilizer, per acre of harvested crop land was $120 on Long Island and $95 in the Connecticut Valley (amaz-

TABLE II

NUMBER OF FARMS, SIZE AND TENURE OF FARMS IN THE MIDDLE ATLANTIC TRUCKING REGION, POPULATION AND FARM EXPENDITURES

	Number of Farms				Number of Farms of Different Sizes, 1925 (Total Farm Land per Farm)						
	1900	1910	1920	1925	9 Acres and Under	10 to 19 Acres	20 to 49 Acres	50 to 99 Acres	100 to 174 Acres	175 to 259 Acres	260 Acres and Over
Southeastern New England	27,792	28,078	23,499	23,473	4,409	3,703	5,907	5,242	3,038	907	739
Connecticut Valley	11,216	10,897	9,747	10,342	1,284	1,640	2,974	2,183	1,156	336	308
Parts of New Haven and Fairfield Counties, Conn., and Westchester and Rockland Counties, N. Y.	8,466	7,886	6,424	5,302	979	922	1,509	1,144	619	201	174
Long Island	6,483	4,338	4,030	3,219	644	507	985	699	256	73	55
New Jersey Section	22,954	22,360	20,476	21,401	4,000	3,659	5,424	4,486	2,949	614	269
Delaware, Maryland and Virginia Section	29,910	33,266	32,717	33,394	3,423	4,033	9,898	8,357	5,073	1,555	1,055
North and South Carolina Section	52,253	59,246	66,133	68,315	5,185	13,207	25,848	13,581	6,568	1,909	2,017
Total	159,074	166,071	163,026	165,446	19,924	27,671	52,545	35,692	19,659	5,595	4,617

	Total Population, 1920 (Number)	Total Farm Population, 1925 (Number)	Colored Farm Population, 1925 (Number)	Farms by Tenure, 1925				Expenditure for 1924		
				Full Owners (Number)	Part Owners (Number)	Tenants (Number)	Managers (Number)	Labor	Fertilizer	Feed
Southeastern New England	3,563,128	101,685	567	21,023	816	1,066	487	$10,076,398	$2,319,373	$14,566,418
Connecticut Valley	913,149	51,151	324	9,011	596	551	119	8,489,230	5,749,407	4,861,406
Parts of New Haven and Fairfield Counties, Conn., and Westchester and Rockland Counties, N. Y.	3,906,054	28,278	194	4,180	210	515	406	3,590,072	416,495	3,425,159
Long Island	2,723,764	17,064	310	1,961	507	568	183	4,057,030	3,040,506	3,650,935
New Jersey Section	2,663,194	102,407	3,762	17,269	572	3,263	297	11,658,192	7,907,005	11,551,751
Delaware, Maryland and Virginia Section	595,153	161,002	69,821	18,599	1,614	13,013	168	5,835,116	7,954,601	2,681,125
North and South Carolina Section	581,373	345,080	148,959	28,076	6,327	34,102	110	2,793,044	10,215,707	1,316,630
Total	14,945,815	806,667	223,937	100,119	10,642	53,078	1,770	$46,499,082	$37,603,094	$42,053,424

ing amounts) and even in the Carolina section averaged $21. Only the Pacific Sub-tropical Crop Region and part of Florida can compare in intensity of cultivation with the Middle Atlantic Trucking Region, and in expenditure for feed and fertilizer per acre of crops, this Atlantic Coast Region exceeds the Pacific Coast Region.

FIGURE 206.—Celery rows between bleaching boards, near Hackensack, New Jersey. (Photo by W. R. Beattie, U. S. Dept. of Agr.)

LAND TENURE

Nearly a third of the farms in the Middle Atlantic Trucking Region are operated by tenants, but the proportions are very different in the northern and southern sections. In the New England sections only about 5 per cent of the farms are operated by tenants, in the New Jersey section only 15 per cent, but in the Delaware and Maryland section the proportion rises to 30 per cent, and in the Virginia and Carolina sections, to about 50 per cent.

Several conditions help to explain this great difference. Probably the most important factor is the negro and his history. Eastern Virginia and eastern North Carolina constituted the very center of the slave-producing region prior to the Civil War, and even today in the Virginia section of the Trucking Region 56 per cent of the farm population is colored, and in the North Carolina section 44 per cent. But, in the Virginia section negroes operate only 44 per cent of the farms, and in the North Carolina section 36 per cent, indicating that a larger proportion of the negro than of the white population are farm laborers. And whereas, only 32 per cent of the owner-operators in the Virginia section are negroes, 63 per cent of the part-owners, and 56 per cent of the tenants are negroes. In the North Carolina section, only 16 per cent of the owner-operators are negroes, but 43 per cent of the part-owners, and 50 per cent of the tenants. The significant thing about these figures, however, is not that the negroes are mostly tenants and part-owners, but that they have advanced greatly in economic status. In the North Carolina section of the region, nearly 30 per cent of the negro farmers are owners or part-owners, in the Virginia portion 42 per cent, while in the Maryland portion there are nearly twice as many negro owners and part-owners of farms as there are negro tenants. Certainly this is a splendid advance to make from a condition of slavery in little more than half a century.

The low proportion of tenancy in the northern portion of the Trucking Region, and the progress that has been made toward ownership in the southern portion, is largely owing to the character of the crops grown. Truck growing, only a little less than fruit growing, requires the eye of the

FIGURE 207.—Early cucumbers being harvested in South Carolina. These will reach the New York market two months before the crop comes in from adjacent New Jersey and Long Island. (Photo by W. R. Beattie, U. S. Dept. of Agr.)

owner. An ignorant or careless tenant can do more injury to a fruit orchard in a few days than the owner can repair in as many years, and although a similar type of tenant on a truck farm cannot cause such permanent injury, he can greatly diminish the season's crop. It is a tribute to the negro race that so large a number are engaged as tenants on truck farms in the southern sections of the region.

In the northern portion of the region, dairying, which is the other principal system of farming, is likewise not well adapted to tenant operation. The capital invested in the cows is too large for many tenants to provide, and the industry is so highly developed that the type of men who can make a success of it are not likely to remain tenants long. The tobacco industry in the Connecticut Valley, likewise, being very intensive and highly technical, involves more capital and training than tobacco production in other parts of the nation, and, therefore, lends itself less readily to tenant cultivation. Only 5 to 10 per cent of the farmers in the Connecticut Valley are tenants.

THE PEOPLE

The population living on farms in the Middle Atlantic Trucking Region was about 800,000 on January 1, 1924, according to the census. Of this number, 102,000 were in the southeastern New England Coast section, 51,000 in the Connecticut Valley, 28,000 in Fairfield County, Connecticut, and in Westchester and Rockland Counties, New York; 17,000 on Long Island, 102,000 in the New Jersey section, 161,000 in the Delaware, Maryland, and Virginia section, and 345,000 in the Carolina section.

National or Racial Origin

The dominant national stock of the rural population of the region is American born. South of Delaware Bay, there are almost no farmers of foreign birth or parentage. Like the Potomac and Ohio Rivers to the west, Delaware Bay practically sets the limit to southward migration of foreign immigrants along the Atlantic Coast. Economic competition with the negro and the social status of agricultural or unskilled laborers, the condition which most immigrants are compelled to accept at first, are both unattractive. North of this boundary the rural foreign stock is found principally in northeastern New Jersey, Long Island, and in Westchester and Rockland Counties, New York, with a less dense distribution throughout southern New Jersey and southern New

England. This foreign stock consists principally of people of German, Irish, English, and Italian origin. There are also several thousand people of Russian stock, according to the census, on Long Island, in northeastern New Jersey, and in extreme southern New Jersey; and several thousand people of Polish stock in the Connecticut Valley.

Over one-fourth of the farm population of the region is negro. Although the negroes are found principally south of the Delaware River, there were nearly 4,000 in New Jersey on January 1, 1925, or 4 per cent of the total farm population. In the Delaware section the negroes constituted over 11 per cent of the total farm population; in the Maryland section, over 28 per cent; in the Virginia section, as already noted, 56 per cent, or over half; but in the North Carolina section, only 44 per cent; and in the South Carolina section of the region, 32 per cent. Prior to the Civil War Virginia produced many slaves for the states to the south, and the extensive acreage of truck crops in the tide-water section of the state provides employment for large numbers of their descendants. On the other hand, because of retarded development of much of the lower coastal plain of North Carolina and northeastern South Carolina, work has not been available to the negroes to any such extent as was to be found in the cotton-growing sections of the Upper Coastal Plain and Piedmont portions of these states. In general, negroes are most numerous on the best soils of the South, where the plantation system developed, while white farmers are most numerous on the poorer soils. Now, however, with the use of fertilizer, some of the poorer soils are becoming very productive, especially for truck crops, and an increase in the negro population of the Carolina section of this Trucking Region may be expected.

Religion and Education

The farm population of native-born American stock, and also the negro population, is mostly Protestant in sympathy, if not in actual membership, except that in the Maryland and Delaware sections there are many Catholics. Lord Baltimore, the colonial proprietor of Maryland, was a Catholic, and many of the colonists whom he encouraged to settle in Maryland were Catholics. With this exception, the farm population of English stock is almost wholly Protestant, and that of German stock is dominantly Protestant, but contains many Catholics; whereas practically all the Irish and Italians are devoted followers of the Catholic faith. Thinly scattered throughout the northern portion of the region, except for a couple of settlements in New Jersey, are a few farmers of Jewish faith; but many, perhaps most, of these Jewish farmers secure more of their income from summer boarders or trading livestock than from purely farming operations. It appears probable that four-fifths of the farming population of the region as a whole is of Protestant faith or sympathy. The leading Protestant denominations are Methodist and Baptist, with a large number of Episcopalians in the southern portion of the region and a large number of Congregationalists in the New England sections.

Most of the farmers' children in the region attend public schools, although there are a considerable number of church schools, Episcopalian, as well

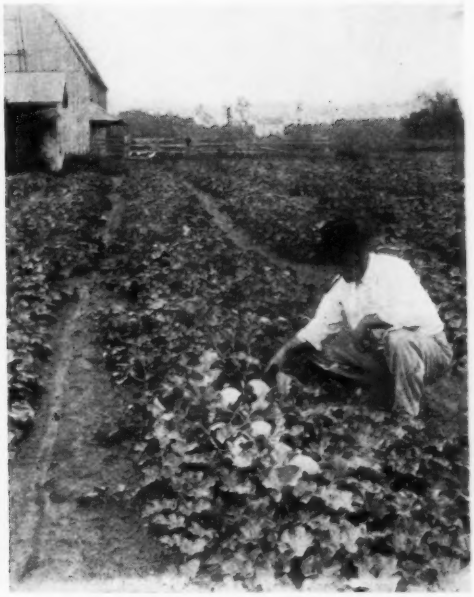


FIGURE 208.—Muskmelons in eastern Maryland. Mr. L. M. Korkran, of Rhodesdale, one of the best growers east of Colorado, is shown in his 20-acre field. (Photo by W. R. Beattie, U. S. Dept. of Agr.)

as Catholic, in the Maryland section of the region especially. An increasing proportion of young people are going to the high school and then to college. There is an agricultural college in each of the twelve states, a part of whose territory is included in this region, and these colleges offer free, or practically free, tuition to citizens of the state. The rapid progress of these state supported agricultural colleges in the conservative East during the past decade or two has been one of the outstanding developments in American education. In several instances these agricultural colleges have provided the nucleus for a state university.

Illiteracy among the rural people of Massachusetts (in which state more than half of the farmers are located in the Middle Atlantic Trucking Region) averaged 3 per cent in 1920; but among the native whites of native parentage, the proportion was only 0.3 per cent, whereas among the foreign born it was 12.6 per cent, and among the negroes, 16.5 per cent. In New Jersey the average rural illiteracy was 4.6 per cent; but among the native whites of native parentage it was 1.5 per cent, among the native whites of foreign parentage only 0.8 per cent, and among whites of mixed native and foreign parentage only 0.7 per cent. However, among the foreign born the ratio was 16.5 per cent, while among the negroes it was 9.1 per cent. In Delaware and Maryland, the proportion of illiteracy in the rural population rises to 6.1 per cent, and 7.4 per cent respectively, owing principally to a rise in the rate among the native whites of native parentage to 3.2 per cent, and 3.3 per cent respectively, and among the negroes to 20.8 per cent and 23.4 per cent respectively. In North Carolina the average rate for the entire state is 14.1, but the proportion among the native white of native parentage is 9.2 per cent and among the foreign born only 7.4 per cent; whereas among the negroes it was 25.7 per cent. Illiteracy increases greatly, therefore, from north to south in the region, except among the foreign born.

Trend of Population

Statistics of farm population were secured for the first time by the census of 1920, but the number of farms, or farmers, and of rural population and families are available each decade. By multiplying the number of farms by rural population per family, close estimates can be made of farm population. These estimates indicate slight losses in the northern section of the region be-

tween 1900 and 1910, offset by considerable increases in the southern portion. The net gain was about 4 per cent. During the next decade, 1910–1920, the loss of farm population in the northern sections became more rapid and extended as far south as North Carolina, but in the section of the region in this state there was a large gain. The net loss for the entire region was 2 per cent.

Between 1920 and 1925 the farm population increased in the New England sections quite notably, owing in a large part to the purchase of vacant farm houses along paved roads by factory employees, professional men, and other persons who work in the cities. These "amphibian" farmers, as they have been called, have a garden and a few acres of hay land, often keep a cow, and nearly always have chickens. Many of them produce farm products having a value exceeding $250, thus meeting the census requirement for a farm. The automobile and interurban electric roads permit these rural residents to go back and forth from their work, and if they are "laid off" in their employment, they have the little farm to fall back on. At other times the wife and children can do much of the farm work, and the vegetables, milk, and eggs help to reduce the cost of living.

This movement of factory employees and other city people into the nearby country for residence is developing in western New York, Michigan, and many other states, though nowhere has it gone so far as in southern New England. In the sections of the Trucking Region adjacent to New York City (Fairfield County, Connecticut, Westchester and Rockland Counties, New York, and Long Island), a notable decrease in number of farms and farm population took place between 1920 and 1925, which suggests that New York City may be too large to permit urban workers to live outside the city on garden farms.

In the New Jersey section of the region, farm population declined about 14 per cent between 1900 and 1920, but apparently increased slightly between 1920 and 1925. However, the decrease in the average size of the farm family resulted in a stationary farm population. In the Carolina section, it appears probable that a slight decrease in farm population occurred, despite the 3 per cent increase in number of farms. For the region, as a whole, a slightly increasing farm population is indicated. All the other agricultural regions to the west, until the Pacific Coast Regions are reached, experienced a decrease in farm population during this period (since the War). In the trend of farm population, therefore, as well as in crops raised, the Middle Atlantic Trucking Region resembles the Pacific Coast.

The commercial production of vegetables has increased very rapidly in the United States during the past ten years, far more rapidly than the increase of population, and at present the prices paid for some of the truck crops are low. But, with the continued growth of the cities, and an increasing proportion of the population engaged in sedentary occupations, it appears almost certain that the consumption of vegetables and small fruits will continue to increase more rapidly than that of most other foodstuffs; and that the agricultural prosperity of this region, which has such obvious advantages in freight rates and in ability to place products on the market in a fresh condition,

will soon revive. However, the total crop acreage in the region may continue to decrease, in part because the feed released by the decrease in horses and mules in the Corn Belt and other midwestern regions, consequent upon the wider use of the tractor, may make the production of corn and hay in this Trucking Region less profitable than in the past.

SCRANTON'S INDUSTRIAL INTEGRITY

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AN analysis of Scranton's industries shows that the city is in a critical period of its industrial development. The growth of the community was made possible largely by the production of coal. Mining continues to be the major activity, but production of anthracite has passed its peak, and the industry is gradually decreasing in importance.

Impending Modification of Industrial Group

Although Scranton has important transportation and manufacturing industries, most of them were established chiefly because of some direct relationship which they bear to mining, the basic industry, or because of their ability to capitalize upon economic or social conditions associated with that industry. It would seem, therefore, as mining continues to decrease in importance, that the city might decline unless it can be demonstrated (1) that the *non-mining* industries can succeed even after production of coal ceases to be important, and perhaps (2) that *new* industries to replace the waning mining activities can capitalize to advantage upon local or regional assets.

It appears probable that Scranton will be able to weather satisfactorily the impending period of industrial reorganization, and that it will not become decadent as have many mining communities when the supply of minerals was depleted. This conclusion seems logical in part because many industries, though related both in their establishment and subsequent success to mining, have become so firmly established that in all probability they will be able to continue satisfactorily long after mining has ceased to be significant. Furthermore, Scranton affords certain local and regional advantages which may lead to a notable expansion of several existing non-mining industries and to the establishment of some not now represented there. Scranton's excellent railroad facilities, its desirable location for assembling raw materials of many kinds, its relative nearness to the great metropolitan markets on the eastern seaboard, and its established industrial population doubtless will be found to constitute leading assets in the period of industrial readjustment which is imminent.

Decadence of Mining the Basic Industrial Activity

Scranton has long been a major anthracite-producing district.[1] Even at present nearly 6,000,000 gross tons are mined in the area annually, and since the beginning of the industry approximately one-tenth of all the anthracite produced in this country has been mined there. Fifteen breakers continue to operate and approximately 15,000 men, or half the total number employed in industries in the area, are engaged in mining operations.

[1] As in common practice, Dunmore is considered to be a part of Scranton in this discussion, for the two are economically and geographically one city. It is likely that they may become one politically for the present separation is quite artificial.

A number of environmental conditions favored the early development and long-continued activity of an important mining industry. A greater thickness of recoverable coal lay beneath much of the Scranton section of the coalfield than was available to the north or immediately to the south. Under portions of the city as many as eleven workable beds of good quality coal were present, having a total thickness of about 65 feet.[2] Under most other sections from five to eight workable beds containing from 20 to 50 feet of coal were present. At Scranton the coal basin is nearly four miles wide, while immediately to the north it becomes narrower and the beds rapidly "spoon out." Several miles to the south the coal basin also narrows considerably and becomes much shallower. When the Susquehanna Valley is reached, however, the basin again widens, and the coal measures are much thicker,[3] a condition which helps to account for the large production in the southern end of the field. Furthermore, an exceptionally large proportion of the coal could be recovered at Scranton, because the beds were practically horizontal, most of them were of suitable grade and thickness, and they lay comparatively near the surface.

In recent years the output of anthracite in Scranton has begun to decrease notably, and the local deposit would be exhausted within about 25 years should the present rate of production continue to the end. Coal will be produced in the area considerably longer than that, however, for the present rate of mining will not continue many more years. Instead, there will be a gradual, though perhaps irregular, decrease in annual output, and some coal doubtless will be mined in this area thirty, forty, or more years from now. It is, nevertheless, inevitable that in the not distant future the industry will have lost most of its present significance, even though it may become practicable to mine some coal which now is considered unrecoverable.

Other types of evidence also indicate clearly that the local mining in-

FIGURE 1.—The Diamond and Mt. Pleasant collieries occupy large tracts of land near the central city. They have been in operation for more than sixty years.

[2] Pennsylvania State Anthracite Mine Cave Commission Report, March, 1913.

[3] Stoek, H. H., 22nd Annual Report (1901–1902), U. S. G. S., Part III, p. 69; and Macfarlane, J., "Coal Regions of North America" (1877), p. 44.

dustry is on the decline. Probably 85 per cent of the coal now produced in Scranton comes from beds which are comparatively thin. Most of the remainder comes from pillars which are being removed in the thicker beds in final mining operations. In order to maintain colliery output, it frequently is necessary to mine lower grades of coal as well as to produce coal which it is difficult and expensive to recover. The per capita output of coal for miners in the area has decreased notably in spite of the wide substitution of machinery for hand labor. Numerous abandoned collieries, and the centralization of mines which no longer are able to support individual breakers because of their diminished outputs also give strong evidence of the waning character of the local mining industry (Figs. 1 and 2).

FIGURE 2.—The Taylor breaker is an example of a modern centralized breaker.

Coal will be produced in large quantities in the southern end of the Northern Field long after the Scranton area has ceased to be of importance for Luzerne County has much larger reserves than Lackawanna County. Scranton, therefore, should be able to secure anthracite for local consumption from that section of the coalfield at comparatively low cost long after the local deposit is exhausted. Furthermore, it is likely that a considerable portion of the coal mined in the southern end of the field will continue to move to market through Scranton and thus will contribute in a measure to the economic welfare of that community.

DIVERSITY OF SCRANTON'S NON-MINING INDUSTRIES

Since the time of its origin, Scranton has possessed one or more industries other than mining which have been of significance in the development of the city. The diversity of its industries at present not only makes Scranton far more stable industrially than most coal mining communities but also does much to insure the future of the city even after the local coal deposit is exhausted (Fig. 3).

The manufacture of iron, based principally on the local coal supply, was Scranton's first important industry. A local supply of ore was used for a time, but it soon proved inadequate in amount as well as unsuitable in quality. From 1840 until 1902, when the furnaces and mills were transferred to Buffalo for

obvious reasons, the manufacture of iron and steel was one of the major industries in the city. In fact, for some two or three decades it was more important than coal mining. Coal mining became an important industry in Scranton only after the iron industry was well established, and after railroads were constructed to the east and to the west, making it practicable to ship large quantities of the product to market.

FIGURE 3.—The principal manufacturing district is located near the center of the city and along the Lackawanna River. An anthracite breaker towers above all other structures, but many manufacturing plants are discernible in this broad, lowland portion of the city.

Industries associated with the railroads are of major importance in Scranton. The attractiveness of anthracite as freight combined with the the strategic position of the city in regard to railroad outlets from the Lackawanna Valley account in the main for the concentration of railroads at that place. In the not distant future, Scranton will be better known for its railroad shops than for its production of coal.

In order to supply the needs of the mines and railroads, numerous metal-fabricating industries have developed. They likewise have been of prime importance in the industrial life of the city. Chief among their products are mining machinery, railroad scales, mine pumps, furnaces, stokers, mine cars, electrical equipment, miner's lamps and tools, structural steel, and other machine shop and foundry products. Since Scranton formerly had an important iron and steel industry, it might be concluded that most of the metal-fabricating plants developed because of the local production of pig iron and steel. Investigation shows, however, that many of them never secured any of their raw materials from the local furnaces, while others did so only in part. Scrap iron and steel were their principal raw materials even at that time. It is likely that those industries will continue successfully even after mining is discontinued locally for they in all probability can find a market for an increased share of their products in distant coalfields. The local railroads doubtless will continue to demand a substantial share of their products. Much of their fuel (bituminous coke and fuel oil) is secured from distant sources, so many are not dependent upon local collieries even at present.

Because the railroads and the mines, as well as most of the industries which have been established primarily to supply their needs, employ men almost exclusively, and because the laboring population is such that many women and girls are not averse to working in factories and mills, there are a number of important industries in Scranton which employ for the most part women and girls. The textile industries rank so high among these "parasitic" industries that they are exceeded only by mining itself in the number of workers employed and in the value of their products. Silk manufacturing is the most important member of the textile group, which includes also the manufacture of cotton and woolen knit goods, lace and embroidery, and clothing. The development of that group of industries in Scranton is said to have been promoted by the position of the city near the western edge of the belt of textile manufacturing centers which extends from southern New England to Philadelphia. As several mill owners stated, Scranton is near enough to the larger centers to share many of their advantages, and at the same time far enough away so that competition for labor is less keen and there is relative freedom from labor troubles. Satisfactory labor supply undoubtedly has been the chief factor in encouraging the development of textile industries in Scranton. Other advantages are suitable transportation facilities for securing raw materials and for marketing their product, cheap power and fuel, relatively inexpensive building sites, low taxes on real estate and plant equipment, and in a few cases a local market of considerable importance for their products. As long as Scranton retains its industrial population, it is likely that local textile industries will continue to succeed.

Scranton also has its shoe factories and its cigar and tobacco factories, in which mostly women and girls are employed. A silk machinery plant, and a motor truck assembling factory find a market for a considerable portion of their products in the anthracite region. The International Textbook Company and its subsidiaries, among which is the International Correspondence School, represent a group of widely known institutions which grew from a very small educational enterprise launched to assist local miners in qualifying for positions as mine superintendents. "So long as the local post office continues to exist" these immense organizations should be able to continue satisfactorily in Scranton. Numerous other industries which supply the varied needs of the local population resemble those which may be found in any urban center of corresponding size. They likewise should be able to continue successfully so long as the city remains, irrespective of the presence or absence of mining industries.

BASIC CHARACTER OF RAILROAD INDUSTRIES

The railroads and the industries associated with them rank second only to the mines in importance in Scranton. More than 5,000 persons living in the city are employed in the various repair shops, locomotive works, engine houses, and railroad offices, and in the operation of trains. With the exception of several hundred girls who are employed as stenographers and clerks, all these workers are men, which fact places the railroad industries among the

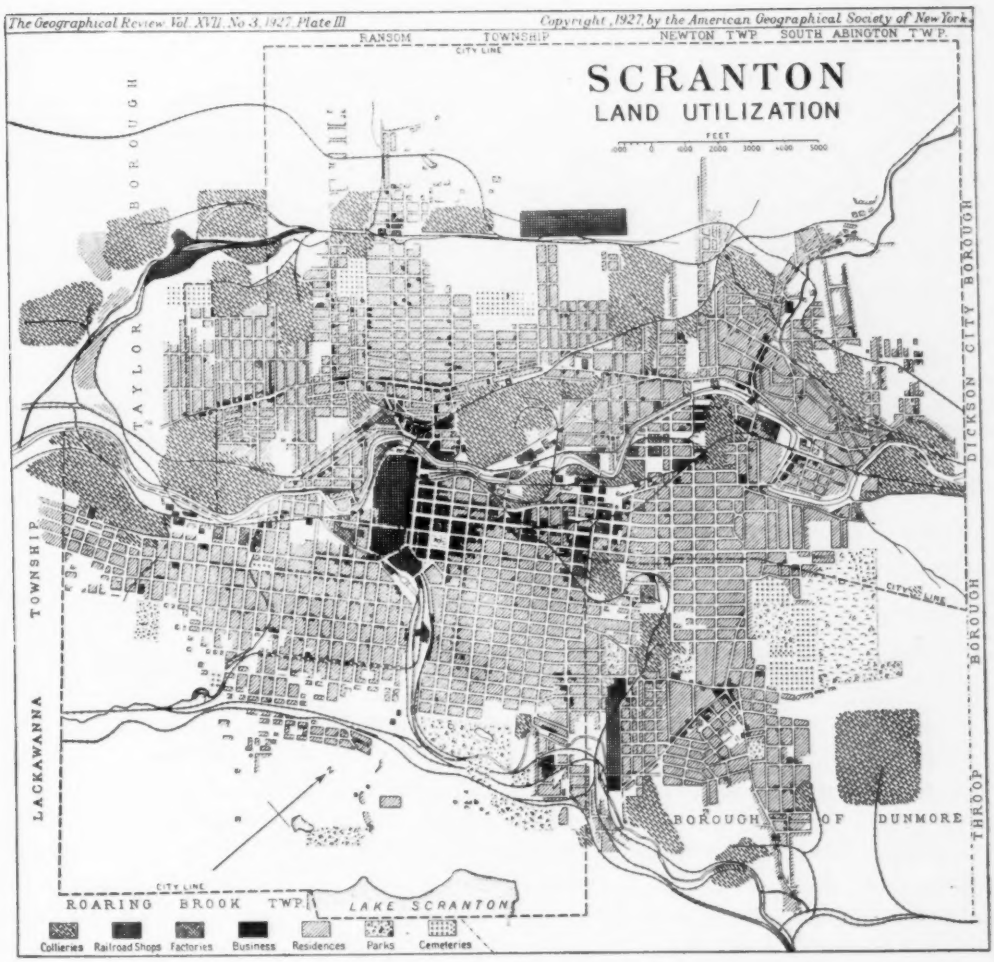

FIGURE 4.—Railroads, railroad industries, and collieries in relation to topography in the Scranton area. (Courtesy of the *Geographical Review*, published by the American Geographical Society, New York.)

more valuable ones which the city possesses. Although the textile industries employ a larger number of workers than the railroads, many of their employees are girls and boys who earn rather low wages and who are engaged in the mills for a few years at most. The total earnings of the railroad workers far exceed those of the textile workers. Furthermore, most of those men are the heads of families and they are engaged permanently in that work. The railroad industries, therefore, tend to be basic in character while the textile industries tend to be parasitic.

Five steam railroads serve the city. They are the Delaware, Lackawanna and Western; the Erie; the Delaware and Hudson; the New York, Ontario and Western; and the Central of New Jersey (Fig. 4). The "Lackawanna" and the Erie railroads have large car and locomotive repair shops in the city. The Lackawanna alone employs nearly 3,000 men in its repair shops and yards. The Erie employs about 1,000 in its shop and yard. Two of the three

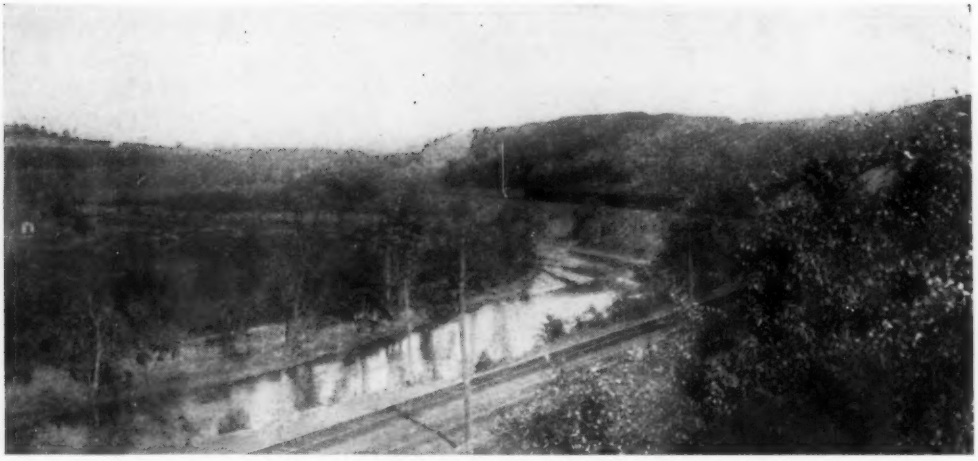

FIGURE 5.—A portion of the Lackawanna Valley just south of Scranton.

electric lines which serve the city also have their repair shops in Scranton.

REASONS FOR IMPORTANCE OF SCRANTON AS A RAILROAD CENTER

Scranton has become an important railroad center chiefly because of its strategic position in the Lackawanna Valley. The construction of railroads and the subsequent movement of trains along the longitudinal trend of the valley are not difficult. Three of the railroads which serve Scranton follow its axis (Fig. 5). At only a few places, however, are there practicable routes by which east-west railroads can cross the valley. At Scranton, two gaps, nearly opposite each other, occur in the almost continuous bordering mountain ridges which rise 1,400 feet above the valley floor (Figs. 6 and 7). The Lackawanna Railroad, which is one of the shorter lines (396 miles) connecting Hoboken with Buffalo, passes through those gaps. It was built from Scranton in both directions soon after 1850 in order to furnish an outlet for the iron and coal produced there.

Branch lines of the Lackawanna extend to the north and to the south along the coalfield and bring large quantities of anthracite to the main line for shipment to market. Even after the supply of coal in the Lackawanna Valley is exhausted, it is probable that much coal from the southern end of the Northern Anthracite Field will continue to be classified at Scranton and shipped to market over the Lackawanna Railroad. Since that railroad is steadily increasing the volume of its general freight and passenger traffic, it is to be expected that the Lackawanna will continue as an important carrier even after anthracite ceases to be its principal item of freight. Therefore, Scranton, because of its strategic position on the main line of that railroad, probably will long continue as an important junction point and railroad center.

All the coal secured by other railroads in Scranton is classified elsewhere and consequently it does not contribute much to the local freight traffic. The large movement of coal through Scranton over the Erie Railroad, however, further illustrates the use of Nay Aug Gap as a railroad outlet from the Lackawanna Valley. The other railroads, which approach

FIGURE 6.—Nay Aug Gap affords a practicable route through the ridge of the Moosic Mountains to the east of Scranton. The Lackawanna and Erie railroads and a trunk highway enter the city through this gap.

the city along the axis of the coal basin, of course help to increase the volume of north-south traffic which focuses there.

LOGICAL LOCATION OF RAILROAD INDUSTRIES

The Lackawanna Railroad located its largest car repair shop, its principal locomotive works, several large round houses, and its operating offices at Scranton for a number of reasons. Since two important branch lines join the main line of the Lackawanna at Scranton, and also because the city is fairly centrally located on the main line of the railroad between New York City and Buffalo, it is a convenient place to which many freight cars may be brought for repairs. Being the principal coal-shipping point on the Lackawanna Railroad, Scranton is the place toward which gravitate large numbers of empty coal cars. Nearly a thousand cars of coal are shipped from Scranton over the Lackawanna every day and approximately the same number of empty coal cars return each day. Scranton, therefore, is

FIGURE 7.—A view across a portion of Leggetts Gap in the ridge of the Bald Mountains to the west of Scranton. The Lackawanna Railroad, the Northern Electric Railroad, and the Lackawanna Trail utilize this route.

the logical place for a large general car repair shop. Such is the Keyser Valley Car Repair Shop located on the west side of the city (Fig. 8). The easy accessibility of that extensive and unused portion of Keyser Valley from the main line of the Lackawanna, was the principal reason for the choice of the immediate site for the repair shop in 1902.

Another advantage which Scranton offers a large railroad repair shop is the availability of a satisfactory labor supply. Large numbers of Russians, Lithuanians, Italians, Poles, Austrians, and Slavs were introduced as mine laborers during the last four decades because they were willing to work for comparatively low wages. As a result of the large influx of cheap European labor into the mining region, the Welch, Irish, and Germans, who constituted the earlier mining population in Scranton, were attracted in large numbers to the railroad industries. The railroad shops, likewise, have been able to secure many satisfactory laborers from among the recent immigrants. As mining decreases in importance in the future, and fewer men are required in that industry, a still larger laboring force probably will become available for the local railroad industries.

A large amount of motive power is concentrated at Scranton because (1) great quantities of coal are shipped to market from that place, (2) much pusher service is required to move loaded trains up the steep grades out of the valley, (3) being 12 to 16 hours from New York City for freight trains, Scranton is a satisfactory place for a division headquarters for through freight service, and (4) Scranton is also an important passenger service division point. As a result of the concentration of motive power there, Scranton is a logical place for locomotive repair shops to supply both running and general repairs. The principal general locomotive repair shop of the Lackawanna Railroad is situated on a terrace just south of the central business district and adjacent to the Lackawanna freight yard (Fig. 9).

FIGURE 8.—The large car repair shop of the Lackawanna Railroad in Keyser Valley with the ridge of the Bald Mountains rising to the west.

FIGURE 9.—A portion of the Scranton freight yard of the Lackawanna Railroad.

Minor repairs on locomotives are made at several round houses.

Since Scranton is the chief freight-originating point on the main line of the Lackawanna, it is the logical place for the operating offices. After anthracite ceases to be the Lackawanna's principal item of freight, Scranton may no longer be the most satisfactory place for those offices.

HANDLING THE COAL TRAFFIC AT SCRANTON

The principal facility for handling the coal traffic at Scranton is the Hampton hump yard, located in the southern portion of Keyser Valley (Fig. 10). That valley contained the only large area of unoccupied land near the main line of the Lackawanna in Scranton which was suitable for a large classification yard. It is also favorably situated with reference to most of the Glen Alden collieries in that portion of the coalfield. Practically all the coal shipped by the Glen Alden Coal Company, much of which comes from the southern end of the Northern Field, is classified there. The Hampton yard occupies the full width of Keyser Valley and extends for more than a half mile along its floor. The hump utilizes, at least in part, the natural grade of the valley. As soon as there are sufficient cars to make up a train for a given destination, the necessary motive power is secured from the round house nearby, and the train is started on its way[4] (Fig. 11).

On trains moving to the east and to the west from Scranton, a large amount of double-heading and pusher service is utilized because of the heavy grades. Coal trains moving eastward over the Lackawanna require four or five locomotives on the steep grades between Scranton and Gouldsboro (Fig. 12). From Scranton east to Nay Aug, a distance of about 6 miles, there is a 1½ per cent grade (75 feet to the mile); and from Nay Aug to Gouldsboro, a distance of about 14 miles, there is a one per cent grade. One of the pushers is cut off at Nay Aug and the others at Gouldsboro.[5] The movement of coal trains westward

[4] Foss and Lyne, *Railway Age*, Vol. 66 (1921), pp. 1097–1098.
[5] *Ibid.*

FIGURE 10.—Classifying coal cars over the hump in Keyser Valley. Bituminous coal, which may or may not contain a small admixture of the steam sizes of anthracite, is the characteristic railroad fuel at Scranton, thus accounting for the dense smoke in the picture.

to Clarks Summit requires a road engine, usually assisted by three or four pusher locomotives. The pushers are dropped at that place (7 miles from Scranton), at the end of the 1½ per cent grade (Fig. 12). From Clarks Summit to Buffalo the grades are less steep and trains can be moved by one road engine. Because of the easier grades beyond Clarks Summit, the west-bound trains are usually heavier than east-bound trains, whose capacity is limited by the drawing power of the single locomotive on several short but steep grades between Gouldsboro and Tobyhanna, the latter of which marks approximately the summit of the Pocono Mountains (Fig. 12). It is proposed to electrify the steep grades to the east and west of Scranton, an improvement which will simplify the handling of trains.

ATTRACTIVENESS OF ANTHRACITE AS FREIGHT

A number of factors have made anthracite coal an especially attractive type of freight. Most of the anthracite is handled in train-load lots, often to be delivered at some terminus or junction point intact. Anthracite is able to bear a fairly high freight charge, and the distances it is hauled are often of considerable length. Anthracite cars can usually be made to carry more coal than their rated capacity, which increases

FIGURE 11.—The southern end of Keyser Valley is crowded with railroad yards, collieries, and power plants.

the car revenue. Cars are loaded by the shipper and unloaded by the purchaser; hence, the railroad is seldom burdened with those expenses. Shipments do not vary greatly from month to month, which fact makes possible the efficient use of coal-carrying equipment at all seasons. Another especially important advantage is that anthracite is produced in a very small area and by large collieries. As a result, the cars are easily and quickly assembled, made into trains, and started toward their destination. For example, about 85 per cent of the 10,775,282 tons of anthracite transported by the Lackawanna Railroad in 1923, came from the fourteen collieries of the Glen Alden Coal Company, four of which alone produced nearly five million tons.

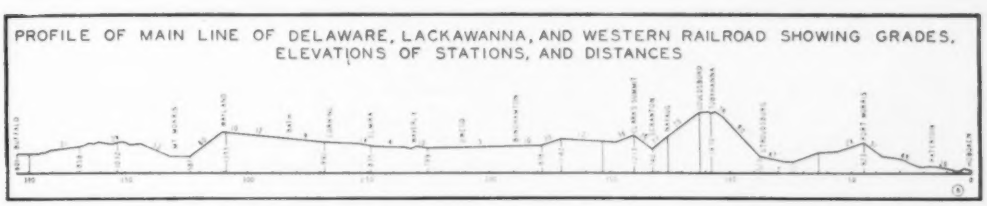
PROFILE OF MAIN LINE OF DELAWARE, LACKAWANNA, AND WESTERN RAILROAD SHOWING GRADES, ELEVATIONS OF STATIONS, AND DISTANCES

FIGURE 12.—Profile of main line of Delaware, Lackawanna, and Western Railroad, showing grades, elevations of stations, and distances.

In order to guarantee themselves a share of that desirable traffic the railroads at a very early date became producers as well as carriers of coal. Although the anthracite-carrying railroads and the collieries are now operated as separate corporations, each railroad continues to get most of the coal which it transports from the collieries which it formerly owned.

Anthracite coal constitutes an important share of the freight tonnage and furnishes a substantial portion of the revenue of the anthracite-carrying railroads. In 1923, for example, 40.8 per cent of the total revenue freight tonnage of the Lackawanna Railroad was anthracite coal. In the same year, transportation revenues from that product made up more than a third of the total freight revenues.

By utilizing a portion of the profits derived from the production and carrying of anthracite in the improvement of their roadbeds, terminal facilities, and rolling stock, several of the anthracite-carrying railroads have notably improved their ability to compete with other trans-Appalachian railroads in the transportation of general freight. Thus, they will be better able in the future to succeed as general carriers and to withstand eventually the loss of the traffic in anthracite which has been their principal source of profit in the past.

SILK MANUFACTURING AN ESTABLISHED INDUSTRY

Scranton is the center of the important silk-manufacturing district of northeastern Pennsylvania, and it ranks among the leading cities of the United States in the manufacture of that product. The manufacture of silk is the second largest industry in Scranton in value of product, and third largest in number of workers employed. There are on the average about 4,000 workers in the silk mills, four-fifths of whom are girls. In

1923, the value of silk products was about $19,000,000, or nearly one-third of the total value of the products of all industries in the area, excluding those of railroad shops and mines.

ADVANTAGEOUS LOCATION FOR INDUSTRY

Silk manufacturing in Scranton is carried on in about fifty widely scattered mills, most of which are small. Several of them, however, employ 200 or 300 workers each, and one mill has about 1,200 employees. Throwing is the principal type of work done, although the weaving of broad silks is of considerable importance.

There are no silk-dyeing plants in Scranton, nor are there any elsewhere in the Northern Anthracite Field. It is claimed that most of the water available in the anthracite region is not suitable for silk-dyeing, and to provide the necessarily large quantities of suitable water would add considerably to the cost of operation. Furthermore, it is desirable that industries of that type be in very close touch with the manufacturers of the silk clothing, many of whose plants are situated in or near New York City, because of the very frequent changes in styles and resultant trade requirements.

Although most of the silk industries of this country are located quite near the Middle Atlantic seaboard, certain important branches of the industry, as throwing mills and mills producing plain goods, are not seriously handicapped though they be some considerable distance from the great silk centers. They are producing a standardized product and in its manufacture highly skilled artisans are not needed. This helps to explain why silk throwing and plain weaving are the all-important phases of the silk business in the Northern Anthracite Field which is on the periphery of the great silk-manufacturing district. However, judging by the frequent trips which managers of Scranton mills make to New York City, even they find it advisable to keep in close touch with their commission houses, with the raw silk dealers, and with their customers. From Scranton a business trip to New York City can be made easily in a day. As the industry at Scranton tends more and more toward weaving and toward a larger production of fancy silks, as it doubtless will do in the near future, this asset of relative nearness to the great silk commercial center will become increasingly valuable.

The relative proximity of Scranton to New York City and the excellent railroad service between the two cities are assets of importance to silk manufacturers in Scranton in still other ways. Most of the mills purchase all of their raw silk and likewise sell their finished product, whether it be thrown silk or woven cloth, through New York dealers. Therefore, transportation charges on shipments of raw silk and of finished products are not unduly large. Since frequent and regular deliveries of raw and finished products are practicable, mills keep small stocks of these materials on hand, and hence the amount of working capital which is required is notably reduced. Because of the high value of silk, shippers desire rapid transportation in order to lessen the time during which the material is en route and their capital tied up. Practically all shipments of silk are by express.

LABOR SUPPLY THE PRINCIPAL ATTRACTION

The presence in Scranton of a satisfactory and abundant labor supply has been the chief reason for the large growth of the silk industry.

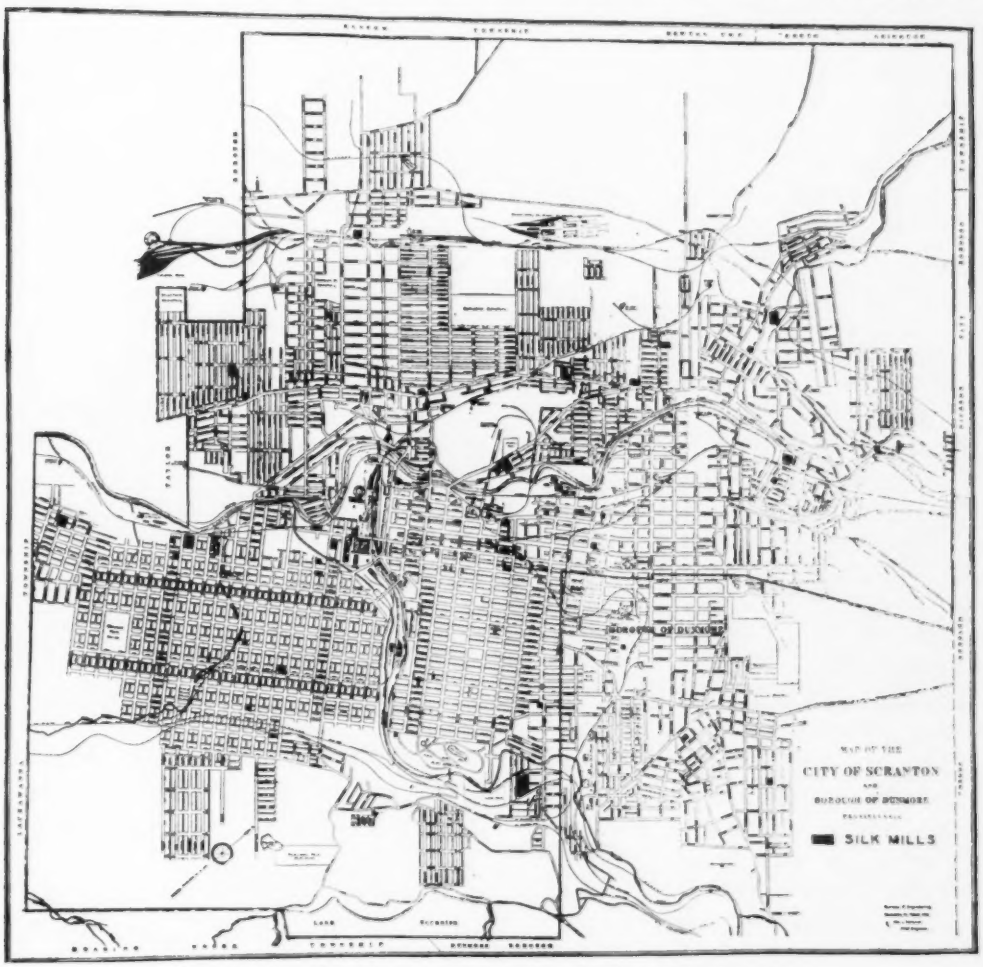

FIGURE 13.—Map showing distribution of silk mills in Scranton.

Most of the work in the throwing mills is simple in character, such as the tending of semi-automatic machinery. Most girls can learn to operate their machines successfully in about two weeks. Even in the weaving mills at Scranton, only some three weeks are necessary to train the average girl, for, as already noted, most of the product is plain goods. Boys are employed in the mills to perform only the heavier work, such as the pushing of trucks and the handling of filled bobbins. Men are employed chiefly as executives, heads of departments, mechanics, and as highly skilled weavers. This is quite in contrast with conditions in Paterson, where fancy weaving and dyeing assume much greater importance, and, as a result, more highly trained workers are required. There, men are to be found in larger

numbers in the mills, and the silk industry is a "bread earning" industry. In Scranton, it tends to be a "pin money" industry, because the majority of the girls live with their parents, and most of them work in the mills for only a few years.

Most of the silk mills are scattered here and there throughout the central Lackawanna Valley (Fig. 13). In most cases, they are distributed along the fringes of the industrial districts, and near the less attractive residential areas. In the more attractive residential areas, where in places even retail businesses are prohibited, there are no silk mills. The close association in many cases of silk mills and mining properties is noteworthy. In fact, this association is so common that when one locates a colliery he may be almost certain that there is a silk mill in the neighborhood.

Nearness to the labor supply is the principal factor affecting the distribution of silk mills in Scranton. Most of the girls working in the silk mills come from the homes of miners, railroad workers, and other classes of laborers. Therefore, it is in the neighborhoods where those types of workers live that one finds most of the mills. Neighborhoods near railroad yards and collieries, with their unattractive surroundings, and the noise of the locomotives and breakers, are not very attractive as residential areas, and large numbers of foreigners live there together with the poorer American families. Most of the children of the prevailingly large families are permitted to work at an early age, and hence the silk throwing mills find a satisfactory labor supply in just such neighborhoods. The closeness of the silk mills to their labor supply gives them an advantage over more distant industries in bidding for that type of labor, in spite of the fact that other employers may offer somewhat higher wages. Since Scranton gives promise of retaining its industrial population it seems likely that textile industries will continue to find a suitable labor supply there.

The location of most of the silk mills in the central valley, within a quarter or a half mile of the Lackawanna River, is related to several other factors (Fig. 14). Larger plots

FIGURE 14.—Scranton's largest silk mill on the right and its largest cotton and woolen mill on the left. The Lackawanna River follows the line of trees in front of the mills. A large silt collecting basin associated with one of the collieries occupies the foreground.

of nearly level land adapted for mill sites were available there than in the upland portions of the city. Most of the mills have no artificial means of regulating the humidity of the air in the spinning and weaving rooms. It is generally recognized among silk mill managers that, at times, silk can be handled more successfully in mills situated in the low-lying, somewhat moister, localities, where there is also some protection from strong winds than in mills located in the less humid, windswept uplands of the city. When the atmosphere is humid and the silk is sufficiently moist, the fiber possesses a proper elasticity and the mill is able to turn out a larger product. According to mill operators, when the relative humidity is low, many threads break, machines stop more frequently, and the output may be reduced 10 per cent or more. In winter, when all windows must be closed and the heat is turned on, mills without humidifying systems experience the most difficulty in manufacturing the silk, which further illustrates the difficulty of handling the product when the relative humidity is low. Also, when there is plenty of moisture in the air, the rapidly moving silk is less susceptible to electrical influences. When dry it is quickly electrified, and loose ends get caught together, causing much trouble. Dry days are expensive days for the silk mills.[6] Direct railroad connections are unnecessary for silk mills, except perhaps in the case of a large mill which receives coal for heating purposes in carload lots. Hence, most of the mills are located away from the railroads, where factory sites are less expensive.

[6] Chittick, J., "Silk Manufacturing and its Problems," pp. 127–128.

Almost all the silk mills in Scranton use electrical power which they are able to purchase at a comparatively low rate. In earlier years, when most of the mills developed their own power, it is said that they were able to secure culm pile coal for little more than the cost of hauling. The plan now under way to develop a large amount of hydro-electric power in Wallen-Paupack Valley, 25 miles to the east of the city, is suggestive of the kind of power which may be widely used for industries in Scranton after the local supply of anthracite is depleted.

BASES FOR FUTURE INDUSTRIAL GROWTH

Thus, it seems that the industrial future of Scranton is reasonably secure in spite of the fact that the industry which has been the principal basis for the growth of the community is slowly disappearing. There is good reason to believe that most of the existing non-mining industries will be able to continue satisfactorily long after mining is gone even though closely related in both their establishment and subsequent success to that industry. Opportunities for the establishment of some industries not now represented in Scranton also appear favorable. Scranton's position near the eastern seaboard, and on established railroad routes between the West and the East, as well as between the Northeast and the South, affords an excellent opportunity for assembling raw materials of many kinds from various parts of the continent and from overseas areas. An equally large range in the choice of markets for finished products is available. Manufacturers in Scranton are at present given somewhat lower rail-

road rates than are those in some eastern seaboard cities for shipments to and from the Middle West. When local supplies of fuel are depleted anthracite may easily be secured for a time from nearby areas to the south; and extensive fields of high-grade bituminous coal are not far distant. The wide use of bituminous coal by all local railroads and a few industries is convincing evidence of the fact that soft coal might without serious handicap be substituted for anthracite for many uses in Scranton even at present. Hydro-electric developments in the vicinity give additional promise of abundant power for local industries. Being in the midst of an established urban area occupied by a large industrial population, with a network of lines of communication for local travel, with a considerable variety of industries already established, and with a determination on the part of the people that the city shall live, it is not difficult to visualize the Scranton of the future as a city of thriving diversified manufacturing industries little different from numerous other cities located on the inner border of the east coast metropolitan area.

A CRITICAL SITUATION IN TWO ONE-CROP WHEAT FARMING DISTRICTS IN CALIFORNIA

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TWO small districts in the Santa Lucia Mountains in California (Fig. 1) are devoted primarily to growing wheat by dry-farming methods. One of these, the Lockwood district, near the middle of the San Antonio Valley, comprises about twenty square miles; the other in Hames Valley is about half this size. The population of the two districts, amounting to about 500, is dense compared with that of the thinly settled grazing lands and unoccupied waste lands which surround them. In the Lockwood district, the houses are fairly evenly distributed; in Hames Valley, the grouping of houses assumes a linear arrangement. This contrast in distribution is related to the dissimilar road patterns which, in turn, represent adjustments to markedly different topographic conditions. The broad lowland which constitutes the Lockwood district was surveyed in sections; roads, as well as fences, in nearly all cases are on, or parallel to, section lines. Along each of the roads making up this rectangular network, the houses are fairly evenly spaced. Extending through the relatively narrow Hames Valley, on the other hand, there is but one main road; from it a few laterals run back to terminate in the neighboring foothills. Practically all the houses of Hames Valley are placed near the main road.

The square mile mapped in Figure 2 represents in a general way the layout of farm land in the wheat farming districts. The surface is level except for the two small hills, the slopes of which are so steep that they cannot be cultivated. Barbed wire fences, about four feet high, bound rectangular fields of various sizes. The area mapped, however, contains more than the usual proportion of fallow, waste, and grazing land; there are also more oak trees than are found in a square mile typical of these districts. The farmstead has been abandoned, but the farm has been divided and the parts added to neighboring holdings.

The wheat raised in the Lockwood and Hames Valley districts is of good quality and in high demand. Its high grade is due to favorable environmental conditions. There is a cool period of growth in the early spring, and a hot, dry summer. In contrast to the Salinas Valley, there are no fogs in these districts. It is chiefly on account of its fogs that barley, rather than wheat, is the staple grain of the Salinas Valley. During some seasons an insufficient rainfall in the Lockwood and Hames Valley districts results in small yields of wheat. The methods of farming in these two districts are alike, and so are the difficulties which confront their farmers; it is, accordingly, convenient to discuss them together.

Under the influence of the recently ended rains, the wheat districts present in early spring a panorama of green fields, broken here and there

by freshly plowed plots whose dark colored soils are in sharp contrast with the surrounding verdure. Fields of tillering wheat are intermingled with those whose fallowed soils are covered with fast-growing weeds. Clumps of green trees along the dust-free roads mark the positions of farm houses. In late summer, on the other hand, the countryside is sere and drab (Fig. 3). The fields of wheat stubble are in color a yellowish grey, and those in fallow a brownish grey; the ground is parched, for little or no rain has fallen for months. Thin, light grey streaks across the land mark the dusty roads.

FIGURE 1.—The locations of the wheat farming districts are indicated by the darkened areas.

The house on a wheat farm, commonly a small, unpainted, one-story building, is set back about fifty yards from the road (Fig. 4). Beyond the house, in an adjoining yard enclosed by a wire fence, are a barn and a chicken house; these three buildings, together, in most cases, with a garage, make up the farmstead. In one part of the yard there is a pump, and in another a large pile of empty tin cans which contained condensed milk, fruits, or vegetables. Several pieces of farm machinery stand under an oak tree nearby. Most of the farms are without gardens. The dilapidated appearance of most of the farmsteads reflects the unremunerative operations of most of the farmers.

For thirty-five years or more the farmers of these districts have cultivated only wheat, with little or no attention to the maintenance of soil fertility. The lands of those who have gone elsewhere have been bought by neighbors who remained. Thus, declining yields per acre have been partly counterbalanced, in many cases, by enlarging the farm units; in this way farmers tried to maintain their incomes. A farmer representative of the more persistent and progressive type took up a homestead of 160 acres near Lockwood in 1884. A quarter of a mile away, another homesteader started farming at about the same time. Both raised wheat. Low yields due to subnormal rainfall discouraged the second farmer, and presently, he sold out to the first and moved away. The first farmer continued to raise wheat for many years by the usual exploitive methods, until the yields were so decreased that he sought some way of increasing them. He decided to summer fallow a portion of his land each year in order to have the moisture of two rainy seasons for one crop, a practice since adopted by others. He again increased the size of his farm by buying eighty acres from a second neighbor who had become discouraged and had gone to seek his fortune elsewhere. Thus, he was able to leave part of his land fallowed every year without reducing the area in wheat each season. Most farm holdings in these wheat raising districts have been increased from 160

acres, the unit under the general homestead act, to between 300 and 400 acres. In some cases, the land cultivated by a farmer is not in one block, as it was not always possible to enlarge a farm by buying contiguous acreage.

The abandoned homes of many who took up homesteads in these districts may still be seen (Fig. 5).

sistant and therefore suited to the scant and occasionally subnormal rainfall of these districts, were introduced into western United States from Australia.[1] Bunyip yields better than Pacific Blue Stem on the lighter and drier soils, and is preferred to Baart by some farmers because the heads are beardless.

The methods of wheat farming are

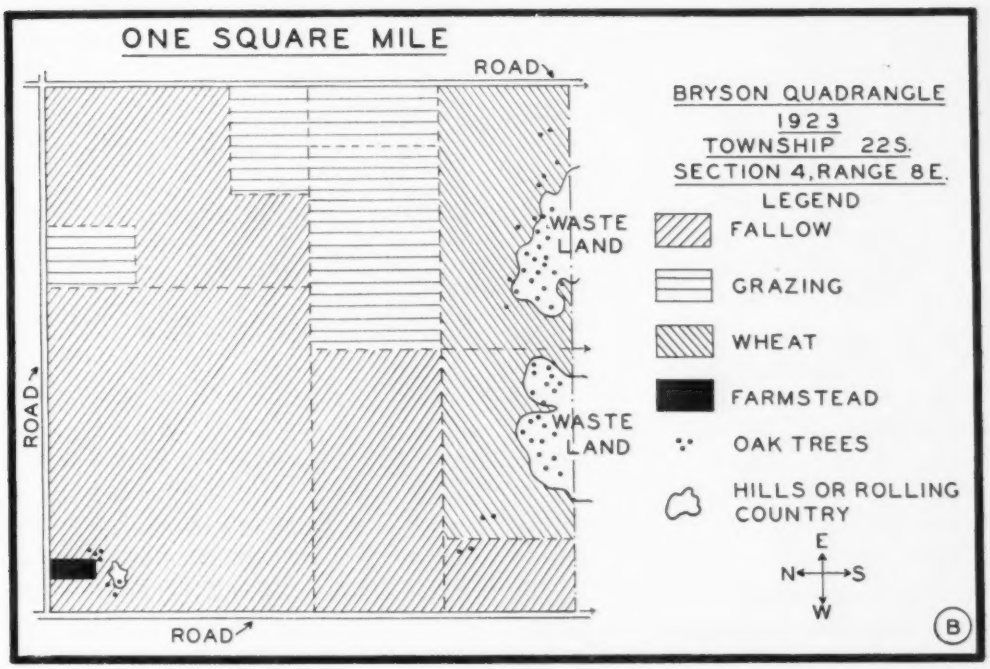

FIGURE 2.—The utilization of the land on one square mile in the Bryson Quadrangle.

The writer counted six in an area of three square miles in the Lockwood district. Although buildings are affected but little by the climate, one of scant rainfall and low relative humidity, many of these homes, still in a fairly good state of preservation, are known to have been abandoned many years since.

The more widely cultivated varieties of wheat in the Lockwood and Hames Valley districts are Pacific Blue Stem, Baart, and Bunyip. These strains, notably drought re-

closely related to conditions of the natural environment. Ordinarily, the rainfall of two winters is needed to raise one crop of wheat. Consequently, a little less than half of a farm usually is seeded each year, the remainder being left as summer fallow. Occasionally, however, when the precipitation of the rainy season has been above normal, a farmer sows wheat on the same land in two suc-

[1] "The Common White Wheats," U. S. Department of Agriculture, Farmers' Bulletin No. 1301, pp. 11, 13, 36.

cessive years. In any case, the availability of moisture is the dominating factor in laying out his program. On the few farms where horses are used, from forty to fifty acres are left in pasture each year.

The land is plowed a short time after the first rain has occurred, generally in November or December. If the first period of rain continues for several weeks, the plowing is necessarily postponed. A tractor with a five gang plow, one which plows ten inches deep, is used ordinarily. The soils of the wheat districts consist largely of "Salinas gravelly loam weathered from unconsolidated secondary deposits derived largely from silicious shales."[2] They are worked easily. The time of seeding varies from early November to late January. It has been found that the yield from an early sowing is a little more than that from a late sowing; consequently, a farmer sows as early as possible. Soon after sowing his grain, a farmer turns his attention to his land in fallow; weeds have been growing rapidly there, and they are now plowed under. The cultivation necessary to exterminate the weeds not only conserves the supply of moisture already in the soil but also increases the capacity of the soil to absorb water from the later rains. If weeds have grown rank again by late spring or early summer, the fallowed land is replowed.

Wheat is harvested from the last of July to the middle of August. Most of the work is done by combined reapers and harvesters, drawn by tractors (Fig. 6). These can be used very successfully on the level or slightly rolling land of the wheat districts. Horse-drawn reapers are used by a few farmers. The limit of cultivation on the slopes of the foothills that surround the wheat districts (Fig. 7) is determined by the maximum slope that can be negotiated successfully by the combined reaper and harvester. The machine can be adjusted to operate successfully on slopes up to about ten degrees. Though some of the farmers own and operate their own harvesting equipment, many of them engage a "harvesting outfit" to do the work.

FIGURE 3.—Part of the Lockwood wheat farming district, showing its character and relief.

Until it is convenient to haul the wheat to a shipping point, the harvested grain remains in the field in sacks dropped from the reaper. Sometimes the sacks are piled conveniently for shipment. Though a period of two or three weeks often elapses between harvesting and hauling, the grain is preserved as well out of doors in the dry summer air as it would be indoors.

The yield of wheat depends largely on the amount of rainfall received during the growing season. Land

[2] Quoted from a letter from Stanley W. Cosby, Research Assistant in Soil Technology, University of California, in 1924. Mr. Cosby participated in a soil survey of the King City Area which included the wheat raising districts. "Salinas gravelly loam" is a provisional term.

previously fallowed commonly produces from fifteen to twenty-five bushels per acre, though rains in April have been known to increase the yield to as much as thirty bushels. On land which has been cropped for two successive years, the yield for the second year varies from four to eleven bushels per acre. It is asserted that the quality of the grain also varies with the amount of precipitation, and that it is best after seasons of high rainfall. A low yield is especially discouraging to farmers in these districts, particularly since they get a crop from only half their land at one time under normal conditions. If there are two successive years of subnormal rainfall, the situation for most of them becomes very serious. Farmers assert that the yield per acre on summer fallowed land is now less than that on land which was cropped year after year in the early stages of wheat growing in these areas. Close observers of the situation in recent years state that the yield on summer fallowed land is diminishing appreciably. On lands bordering the mountains, the yield is diminished still further by pests. Ground squirrels and gophers carry off quantities of grain which, for a single summer, reach a significant total. These animals breed rapidly in neighboring areas of waste mountain land, where they are, for the most part, unmolested.

FIGURE 4.—A typical farmstead in the Lockwood district.

Farmers in the Lockwood district store their grain at San Lucas (Fig. 1), the nearest shipping point on the Southern Pacific Railway. San Lucas is sixteen miles from Lockwood, and the expense of hauling grain this distance decreases the returns considerably; the usual charge for haulage is $2.50 a ton. Owing to the "Lockwood grade" in Espinosa Canyon, grain must be taken in relatively small loads. In a distance of about two miles of winding road, the descent is nearly 500 feet. Many farmers have trucks in which they haul their own grain; others make contracts with neighbors to haul for them. Wheat from Hames Valley is hauled to the railway at Bradley (Fig. 1), about six miles away.

In an effort to get as high a price as possible for their grain, farmers recently formed a "wheat pool." By means of subscriptions an elevator was built at San Lucas in which wheat belonging to members of the pool may be stored free of charge until the market price is satisfactory. Other farmers shipping from San Lucas pay storage charges at the Southern Pacific warehouse. On the delivery of pooled wheat to the elevator or warehouse, the owner is paid about sixty per cent of its average price at San Lucas; this payment is made through local banks on the basis of his warehouse receipt; the remainder is paid when the wheat has been sold. It is difficult for the farmers of these districts to coöperate in a wheat pool because many of them

FIGURE 5.—An abandoned farm house in the Lockwood district.

need money badly when the grain is harvested; if they pool their grain, they must wait longer for the full price than they would if they sold to the local buyers who come from King City or Salinas (Fig. 1) to bid on their crops.

Since very few of the farmers keep accounts, it has been impossible to get accurate data concerning the financial status of the wheat industry in the Lockwood and Hames Valley districts. Tables I and II were compiled from the estimates of two wheat farmers who are in less difficulty financially than most of the "one-croppers."

TABLE I

CAPITAL INVESTMENT IN A WHEAT FARM

Capital invested in land on a wheat farm of 350 acres at $50 an acre	$17,500
Machinery	7,500
Buildings	4,000
Total	$29,000

The present critical situation with regard to wheat farming in the Lockwood and Hames Valley districts was brought about partly by the use of machinery which the farmers could not afford, and which, in many cases, they did not know how to operate properly. Tractors costing $2,000 are being used on farms where horses could be used more economically. Most of the farm machinery of these wheat areas is idle for at least six months of the year. A farmer generally buys a tractor on an instalment plan of payment, and in many cases he is forced to borrow from a local bank the money with which to make the payments as they fall due. Experience in learning how to operate some of the machinery has proved costly. There are "breakdowns," and hired help is paid for time spent in the shade while a mechanic from "town" makes the necessary repairs. The replacement of worn-out parts is a considerable expense. There is a large gasoline bill to be met for the period of operation. A salesman for a large tractor company said to the writer regarding

TABLE II

COST OF RAISING ONE ACRE OF WHEAT

Plowing	$2.50	
Harrowing	.40	
Seeding	.60	
Seed	.85	
Total		$4.35
Harvesting	$2.50	
Sacks	1.40	
Fire insurance	.23	
Total		$4.13
Marketing		$1.50
Tax		.25
Total cost per acre		$10.23
Gross receipts per acre		$16.56*
Gross income per acre		6.33
Gross income for one year (income from 350 acres of wheat divided by 2)		1,107.75
Depreciation:		
Machinery ($7,500 at 10 per cent)		750.00
Buildings ($4,000 at 2 per cent)		80.00
Total depreciation		$830.00

A farmer's gross income for a year ($1,107.75) less depreciation ($830) leaves $277.75 to cover interest on his investment, and taxes on buildings and personal property. These deductions reduce the farmer's net income to a minus quantity.

* Gross receipts per acre are figured as follows:

Average yield per acre on summer fallowed land (9 sacks of about 115 lbs. each)	1,035 lbs.
Selling price of wheat (1923, a typical year)	$1.60 per 100 lbs.

FIGURE 6.—A combined reaper and harvester used in the Lockwood district.

farmers in these districts, "They don't know how to operate tractors profitably." A young farmer's mother asserted, "Our troubles started when we got a tractor." Two farmers in Hames Valley were persuaded to buy a tractor by a salesman who declared the use of such a machine would increase the yield of wheat per acre. They were not familiar with the operation of a tractor and it cost them three dollars an acre for seeding alone; even then the crop was not well sown. A neighboring farmer who used horses did similar work at a cost of fifty cents an acre. A farmer in the Lockwood district recently decided to lease his land because his tractor and other farm machinery had worn out; he concluded that if he purchased a new outfit he "would be paying for it during the rest of his life." A bank in King City owns a tractor and a combined reaper and harvester which were turned over to it by a farmer who could not repay the loan with which he bought them.

The ease of borrowing money and of obtaining goods on credit have also been factors contributing to the present unfortunate financial condition of most of the wheat farmers. Until recently, it has been relatively easy for the farmers to obtain money from local banks. The King City branch of a large city bank has been a keen competitor of the local banks, and, being anxious to secure the farmers' business, it lent them money readily.[3] Having established its business, a less lenient policy is indicated by the statement of its officers to the effect that "we consider the one-crop farmer a very poor risk and we don't want to carry him." Similarly, the stores in King City have been willing in the past to sell goods on credit, being content to receive payment annually when the farmers sold their crops. However, they, too, have come to a realization of the risk in carrying a one-crop farmer, and they now with one accord demand a "thirty day payment".

Another factor contributing to their present dilemma is the aristocratic pride of the farmers. During periods of leisure, amounting in all to five or six months a year, a farmer feels he must ride in a good looking automobile, and, as one man ex-

[3] See "Menace of the Branch Bank," in San Luis Obispo County Farm Bureau Monthly, Sept., 1925, p. 3.

pressed it, "put on dog". A farmer in the Lockwood district who owned a cheap, but serviceable, automobile borrowed enough money from a bank to buy a more elegant car. Unfortunately, in order to pay his debt, he was forced to sell the new machine. Other farmers have had similar experiences. False pride has kept many farmers in these districts from bettering their condition by engaging in other forms of agriculture. An incident which happened some years ago in King City indicates the attitude of many one-crop farmers. The subscribers to the rural telephone system of the Lockwood district were holding their annual meeting. Before the meeting was over, one farmer excused himself, saying that he had to go home to milk his cows. Another farmer present whispered to the writer's informant, "Would you milk a lot of d—— cows?"

Many of the one-crop farmers are in a rut and do not know how to help themselves; they think the only thing they can do is to raise wheat. A farmer who was asked the question, "What are you going to do since you are not making a success of wheat farming?" replied, "I don't know." One man said to the writer, "If the government would only do something for us." The isolated location of the wheat raising districts makes it difficult for farmers to keep in close touch with agricultural progress elsewhere in the state. Lying west of the main route of travel through the Salinas Valley, these districts are seldom visited by agriculturists from other districts. The wheat farmers are very conservative and are loath to change their old ways of doing things.

A subnormal rainfall in 1923–1924 and 1924–1925 brought home to the wheat farmers the seriousness of their situation. During the season 1923–1924, the rainfall at Jolon (Fig. 1) was 12.65 inches as compared with a normal rainfall of 18.44 inches, and during 1924–1925 it amounted to only 9.60 inches. A farmer, who had borrowed money to plant and harvest his crop during the first of these seasons, did not produce enough wheat to repay the loan. He borrowed again the next year; again things turned out badly, so that he went in despair to the bank and said, "I can't make it; take my farm." Another man, disgusted with the situation, did not plant any wheat during the 1924–1925 season. Farmers in these districts cannot meet interest payments on old debts owed the banks, and the banks are very reluctant to loan any more money to a one-crop farmer.

The attitude toward the present situation of at least one farmer in the Lockwood district and the steps which he has taken to better his condition are worthy of emulation by other farmers. When the writer visited this district in 1923, the owner of the L—— ranch was a one-crop farmer who was barely making enough to pay his debts. He was accustomed to borrow enough from a bank in King City to sow his crop and harvest it. When the crop was sold, he had little money left after paying costs, loans, and interest. He had been a wheat farmer for forty years, and was loath to change his methods of farming. But he realized the gravity of his situation and he saw that his neighbors were no better off. Mr. L—— had kept one cow to supply milk for his household; in this respect he differed from the large majority of one-crop farmers. He decided he would buy more dairy

cattle and become a general farmer.[4] The machinery side of his hay barn was transformed into a cow barn by putting in stanchions, at a cost of fifteen dollars. He made a milk house from the boards of a chicken house which he pulled down; another chicken house was turned into a hog pen. When the writer visited his ranch in 1925, he had five dairy cows, four hogs, and about fifty chickens. He related with pride that he was putting forty dollars a month in the bank as a net profit on cream alone. The cream is taken from his ranch to King City each day in the automobile which carries the mail; from King City it is shipped to San Francisco. The hogs were bought on July 13, 1925, at fifteen cents a pound. They were then five weeks old, and together weighed ninety-nine pounds. On September 10 they weighed 391 pounds; hogs then were fetching fifteen cents per pound in the market. The increase in their value, therefore, was $43.80. Since purchased they had consumed 5,900 pounds of skimmed milk and 210 pounds of barley, together worth about $14.75. Their owner accordingly could have sold the four hogs on September 10, at a profit of about $29. This farmer's cows are fed on barley hay and wheat stubble. Wheat and skimmed milk are fed to his chickens. Since the beginning of his venture in diversified farming, Mr. L—— has kept careful accounts of expenditures and income; in this respect, also, he is exceptional among the farmers of the wheat districts. Further, Mr. L—— owns a combined reaper and harvester which is drawn by six horses and which he and his son can operate together. His grain is cut just when it is ripe; it accordingly does not "shell out" as does that of farmers who wait unduly for the services of a harvesting outfit. Horses are less expensive to use than a tractor; their feed is raised on the ranch and they are capable of reproducing their kind. In 1925 Mr. L——'s son helped a neighbor plant his wheat and the neighbor reciprocated. A banker said that other

FIGURE 7.—The limit of cultivation on slopes in the Lockwood district.

[4] See "She Makes Her Dakota Farm Pay," By Helen Bullit Lowry, in *The World's Work*, Oct., 1924, p. 643.

farmers had borrowed $1,000 to sow a crop similar to that which these men had planted without borrowing any money. The storekeepers and bankers in King City recognize that Mr. L—— has become a general farmer. Formerly, they shunned him, knowing that he wanted credit. Now that he has money, they compete for his trade. The storekeepers are willing to sell to him more cheaply than they could if he had to buy on credit; his bank considers him a good risk, and is ready to loan money to him. This farmer's success has been modest, to be sure, but it means financial security and an unmortgaged home.

The example of the owner of the L—— ranch could be followed advantageously by other one-crop farmers of the Lockwood and Hames Valley districts. Dairying as a phase of general farming has proven successful on three farms there of which the writer knows. In addition to the profit from cream, the manure from the cowbarn helps greatly to build up a soil deficient in organic matter. Part of the Lockwood district is not far from grass land which could be rented and on which a few beef cattle could be raised. A farmer who rented a piece of such land in 1925 was able to meet an interest payment on his debt by selling a few calves. Vegetables in a small kitchen garden could be irrigated from the well at each house. Vegetables, however, are especially affected by extremely high temperatures which often occur here during the middle and early part of the summer. Unofficial records of 105° to 110° F. in the shade have been recorded each day for a week. One farmer found from experience that tamale corn can be successfully raised under such conditions.

By engaging in diversified agriculture, one-crop farmers can better their business and bring a new era of prosperity to a worn and impoverished countryside. The leisurely one-cropper will have to change his habits of life to conform to the more exacting routine of diversified agriculture. Those who can adapt themselves to a new order of things will survive, and those who cannot must seek a living elsewhere. In such areas as these, the advice and coöperation of a competent county farm adviser are especially needed. One farmer in the Lockwood district built a silo. It was not air tight, however, and his ensilage spoiled. Instruction in the technique of building such structures would have helped.

One of the more obvious necessities in these dry-farming districts is that of providing adequate shelter for farm machinery. Ploughs, harrows, cultivators, and other implements are left standing in the open when not in use. Exposed to winter rains and summer suns, they deteriorate rapidly. Very few farmers have adequate housing for all of their farm machinery.

The banks at which the farmers of these districts do business would make a mistake in pressing their customers too hard for payments at this time. If banks foreclosed their mortgages, the land would have to be leased to renters who would not be any better off than the present owners. Farmers state that the branch of the larger city bank already referred to is operated by men who are not closely in touch with farming conditions, and who are unwilling to do their share in helping

to solve a difficult agricultural problem. They assert that the stock of local banks on which they formerly relied was owned by cattlemen and dry farmers who understood the needs of agricultural communities better than the stockholders of city banks. However, since the success of all of these banks is dependent on the success of the farmers, they must do their share in helping to solve the farmers' problems.

BOOK REVIEWS

DEPARTMENT OF COMMERCE
Bureau of Foreign and Domestic Commerce

Commerce Yearbook, 1928

Three volumes of more than ordinary interest to geographers have just been issued. The Commerce Yearbook, Volumes I and II, and the Statistical Abstract. Volume I of the Commerce Yearbook covers domestic and foreign trade for the United States, and also discusses transportation, industry, and general economic conditions within the country for the year 1927. Volume II deals with international trade, and economic conditions in countries throughout the world. It is illustrated with many country maps, world maps, and the Goode Political and Physical maps of the continent, in colors.

Both volumes may be obtained from the District Offices of this Bureau or from the Superintendent of Documents, Washington, D. C. The price of the former is $1.00, and of the latter $1.25.

The Statistical Abstract, 1928, covers a wide range of statistical material and is invaluable for reference to the economic and business world. It also is obtainable from the District Offices of this Bureau or from the Superintendent of Documents, and the price is $1.00.

Foreign Trade of the United States in the Fiscal Year 1927–1928. By Lawrence B. Mann and Grace A. Witherow. Trade Information Bulletin No. 572. Price, 10 cents.

Foreign trade during 1927–1928 continued to be a most dependable backlog for domestic business. There was a particularly large expansion of our exports of manufactures in the early part of 1928, and this foreign demand was an important factor in the increase of factory operations during the spring months. The total value of our foreign trade for the fiscal year 1927–1928 was greater than in any recent year except 1926–1927. This bulletin discusses briefly the distribution of trade, the commodities handled, and the values.

Flour Markets of South America. Trade Information Bulletin No. 570. Price, 10 cents.

All countries of South America except Argentina, Chile, and Uruguay are largely dependent upon foreign sources for their supply of flour. Some 3,000,000 barrels of foreign flour go to those countries which do not produce sufficient for their own needs, fully one-half of which are the products of American markets. The exports of flour from the United States to South America have for several years past been exceeding the shipments from Canada and Argentina combined. Of the total amount of wheat available for consumption in those countries whose domestic production is inadequate, about one-fourth is grown locally, one-half is imported as wheat for milling, and about one-fourth is imported in the form of flour. This bulletin is a careful analysis of the flour market in South America.

Raw Materials Entering Into the Japanese Iron and Steel Industry. Trade Information Bulletin No. 573. Price, 10 cents.

The Japanese iron and steel industry of today is but little more than a quarter century old. The securing and maintaining of an adequate supply of good quality iron ore from which to produce pig iron and raw steel demanded by the growing domestic market has been the greatest problem facing the Japanese industry. Their supply of coke and coking coal to smelt and otherwise transform this ore into a usable form also has required constant consideration. The bulletin deals with the solution of this problem.

The Italian Chemical Industry. Trade Information Bulletin No. 577. Price, 10 cents.

Great progress has been made during the past few years in the Italian chemical industry which is rapidly obtaining a place of international prominence, even though Italy possesses little sub-soil wealth, and lacks the essential raw materials for the development of self-contained industry. Salt and sulphur are the only two basic raw materials which Italy possesses in any abundance. Although coal does not exist in Italy, power is by no means lacking owing to the intensive development of hydro-electric energy. Italy ranks fourth among European countries from the standpoint of the production and consumption of the products from its chemical industry.

Cocoa in West Africa. By Leonard J. Schwarz. Trade Promotion Series No. 68. Price, 15 cents.

Cocoa is subject to the food laws of the United States. In order to determine whether the standard for cocoa importation is fair to all concerned, this study of the preparation, curing, and handling of cocoa in the Gold Coast, Nigeria, British Cameroon, and Fernando Po was made in 1927, amounting to 190,000 tons, valued at $56,816,000, more than one-third of which came from British West Africa. As West Africa furnishes about two-thirds of the world's cocoa supply, the bulk of which comes from the British colonies of the Gold Coast and Nigeria, this study is decidedly interesting and instructive, particularly since comparatively little information has heretofore been available to the American cocoa industry because of a lack of Government representation in the cocoa areas.

The External Trade of New England. By Robert J. McFall. Domestic Commerce Series No. 22. Price, 10 cents.

Knowledge of existing trade movements covering the transportation of commodities between the various large regions of the country has been recorded. This significant study presents for the first time such data for New England, and includes all movements of goods into and out of New England as a whole in its trade with the rest of the United States as well as with foreign countries.

United States Trade With Latin America in 1927. By H. S. Giusta. Trade Promotion Series No. 71. Price, 15 cents.

United States trade with Latin America has increased steadily during the past quarter of a century and today constitutes 22.2 per cent of our total trade with the world, as compared with 19.9 per cent in 1913. In 1927 our commerce with this area for the third successive year exceeded $2,000,000,000. The present bulletin discloses the trade of the United States with South America in far more detail than preceding bulletins.

The British Lumber Market. By A. E. Boadle. Trade Promotion Series No. 64. Price, 60 cents.

The United Kingdom is the largest wood-importing country in the world, and the United States ranks third in this market, being surpassed only by Finland and Sweden. Imports of American lumber cover a wide range of products. An outstanding feature of these lumber exports to the United Kingdom has been the rapid increase in the use of American doors in the British market. Approximately 80 per cent of the mahogany lumber imported by the United Kingdom is supplied by the United States, it being manufactured here from logs imported largely from Central American countries.

Foreign Markets for United States Eggs. Trade Information Bulletin No. 584. Price, 10 cents.

South African Footwear Trade and Industry, 1927. Trade Information Bulletin No. 576. Price, 10 cents.

Selling American Leather in Germany. Trade Information Bulletin No. 574. Price, 10 cents.

The Electrical Equipment Market in the Netherlands and Belgium. Trade Information Bulletin No. 578. Price, 10 cents.

European Markets for Rubber Sundries and Specialties. Trade Information Bulletin No. 583. Price, 10 cents.

Distribution Centers for Automotive Products in Brazil. Trade Information Bulletin No. 581. Price, 10 cents.

Developing the Smaller Leather Markets Abroad. Trade Information Bulletin No. 579. Price, 10 cents.

International Sole Leather Trade and Production in 1927. Price, 10 cents.

Monthly Summary of Foreign Commerce of the United States, Parts I and II. Subscription price, $1.25 per year. Single copy, Part I, 10 cents; Part II, 5 cents.

These bulletins present monthly reports on the foreign commerce of the United States by commodities and by trade regions. A total of trade of the year to date also is included. The June issue contains the earliest available figures for the foreign trade of the United States for the preceding fiscal year, while the December number presents the summary review for the calendar year just past. This is an extremely valuable publication.

BUREAU OF FISHERIES

Trade in Fresh and Frozen Fishery Products and Related Marketing Considerations in Jacksonville, Florida. By R. H. Fiedler. Bureau of Fisheries Document No. 1036. Price, 10 cents.

This survey is the ninth in a series of trade investigations made by the Bureau of Fisheries, the cities previously canvassed being Louisville, Pittsburgh, Chicago, Minneapolis, St. Paul, Seattle, Boston, New York City, and St. Louis. Jacksonville is favorably situated with respect to productive centers, transportation, and warehouse facilities though the nearby waters support no extensive fisheries. The wholesale fish trade in Jacksonville is just developing and considerable expansion may be expected.

Report of the Commissioner of Fisheries, 1927, with Appendixes. By Henry O'Malley, Commissioner.

This annual report covers a number of problems significant to the fisheries of the United States such as International Relations; Upper Mississippi River Wild Life and Fish Refuge Act; Propagation and Distribution of Food Fishes; Commercial Fisheries and Technological Investigations; Biological Investigations; Alaska Fisheries Service; Alaska Fur-Seal Service. Complete statistics for the past year also are included in the volume.

The Fisheries Service Bulletin is issued monthly by the Bureau of Fisheries and may be obtained without charge by writing that Bureau.

UNITED STATES COAST AND GEODETIC SURVEY

The United States Coast and Geodetic Survey, Its Work, Methods, and Organization. Special Publication No. 23.

Geographers will all be interested in this interesting survey of the work of the U. S. Coast Survey which, from its inception in 1807 to the present, is of more than passing value to the geographer. The Coast Survey is now establishing precise levels and locations throughout the United States upon which all American maps are based. These data are also essential to railroads and railroad engineers, irrigation engineers, and in

fact all groups dealing with construction projects covering a large area or a smaller region such as would be covered in a city telephone and sewerage system.

Tide Tables United States and Foreign Ports, 1929. Price, 75 cents.

Radio Acoustic Position Finding. Special Publication No. 146. Price, 20 cents.

Supplement to United States Coast Pilot, Gulf Coast, Key West to the Rio Grande, September 8, 1928.

Magnetic Declination in Texas in 1927. By W. N. McFarland and Robert W. Knox. Series No. 417. Price, 15 cents.

Results of Magnetic Observations in 1927. By Daniel L. Hazard. Series No. 423. Price, 5 cents.

Supplement to United States Coast Pilot. The Hawaiian Islands, August 18, 1928.

Catalogue of Charts, Coast Pilots, Tide Tables and Current Tables of the Philippine Islands, August 1, 1928. Series No. 422.

Catalogue U. S. Coast and Geodetic Survey, Charts, Coast Pilots, Tide Tables, Current Tables, October 1, 1928. Series No. 425.

BUREAU OF MINES

Coal in 1926. By F. G. Tryon, O. E. Kiessling, and L. Mann. Mineral Resources of the United States, 1926. Part II. Published Nov. 15, 1928. Price, 30 cents.

Analyses of West Virginia Coals. By J. Brian Eby. Technical Paper No. 405. Price, 20 cents.

Bauxite and Aluminum in 1927. By James M. Hill. Price, 5 cents.

Platinum and Allied Metals in 1927. By James M. Hill. Price, 5 cents.

Asphalt and Related Bitumens in 1927. By G. R. Hopkins and A. B. Coons. Price, 5 cents.

Slate in 1927. By A. T. Coons. Price, 5 cents.

Copper in 1926. (General Report). By C. E. Julihn and Helena M. Meyer. Price, 10 cents.

Feldspar in 1927. By Jefferson Middleton. Price, 5 cents.

Silica in 1927. Price, 5 cents.

Antimony in 1927. By J. W. Furness. Price, 5 cents.

Gold and Silver in 1926 (General Report). By J. P. Dunlop. Price, 10 cents.

Mercury in 1927. By J. W. Furness. Price, 5 cents.

Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1927. By J. P. Dunlop. Price, 5 cents.

Gold, Silver, Copper, Lead, and Zinc in Arizona in 1926. Mine Report. By C. N. Gerry. Price, 10 cents.

Gold, Silver, Copper, Lead and Zince in Utah in 1926. Mine Report. By C. N. Gerry. Price, 10 cents.

Gold, Silver, Copper, Lead, and Zinc in Nevada in 1926. Mine Report. By C. N. Gerry. Price, 10 cents.

Gold, Silver, Copper and Lead in South Dakota and Wyoming in 1926. Mine Report. By C. N. Gerry. Price, 10 cents.

Gold, Silver, Copper and Lead in South Dakota and Wyoming in 1926. Mine Report. By Chas. W. Henderson. Price, 5 cents.

Copper in 1926 (General Report). By C. E. Julihn and Helena M. Meyer. Price, 10 cents.

Gold, Silver, Copper, and Lead in South Dakota and Wyoming in 1926. Mine Report. By Chas. W. Henderson. Price, 5 cents.

Geophysical Prospecting: Some Electrical Methods. By A. S. Eve and D. A. Keys. Technical Paper No. 434. Price, 10 cents.

Potash in 1927. By A. T. Coons. Price, 5 cents.

A System of Analysis for Oil-Field Waters. By C. E. Reistle, Jr., and E. C. Lane. Technical Paper No. 432. Price, 5 cents.

Production of Explosives in the United States During the Calendar Year 1927. By William W. Adams. Technical Paper No. 435. Price, 10 cents.

A Study of the Less Volatile Oils in Salt Creek (Wyo.) Crude. By H. M. Smith. Technical Paper No. 428. Price, 5 cents.

Fuller's Earth in 1927. By Jefferson Middleton. Price, 5 cents.

Leakage from High-Pressure Natural-Gas Transmission Lines. By E. L. Rawlins and L. D. Wosk. Bulletin No. 265. Price, 25 cents.

Quarry Accidents in the United States, during the Calendar Year 1926. By William W. Adams. Bulletin No. 288. Price, 15 cents.

Five Hundred Tests of Various Coals in House-Heating Boilers. By P. Nicholls, S. B. Flagg, and C. E. Augustine. Bulletin No. 276. Price, 15 cents.

BUREAU OF THE CENSUS

Survey of Current Business. Subscription Price, $1.50 per year.

This is a monthly publication presenting indexes of price productions and business conditions throughout the United States. It should be of considerable value to the geographer in analyzing commercial trends in relation to geographic conditions.

PANAMA CANAL

The *Panama Canal Record* is published weekly. Subscription rate, 50 cents a year.

This weekly bulletin presents a record of canal traffic and movements of vessels through the canal throughout the year.

LISTS OF GOVERNMENT PUBLICATIONS

Monthly Lists of Publications.

The Department of Commerce issues monthly a list of publications covering all Bureaus. This

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HELEN M. STRONG.

BOWMAN, ISAIAH. *The New World.* Fourth Edition. iv and 803 pp. with 257 maps. World Book Co., New York, 1928. $4.80.

Since its first issue in 1921 Isaiah Bowman's *The New World* has been by far the best book available on the problems of political geography, and with its complete revision in this fourth edition it promises to retain the eminent position it has held so long. Completely revised to include all the changes that have taken place, all the new developments and trends in the nations of the world, all the significant factors that are playing their part in the politics of the world at present, *The New World* becomes almost an authoritative encyclopedia of modern world affairs.

In the field of Political Geography no one in America and few if any elsewhere is better informed or ranks higher than Isaiah Bowman. As Director of The American Geographical Society of New York he has made it probably the foremost center of geographic research in the world, assembling in its spacious building a superb reference library of geographic lore and an exhaustive collection of important maps. Under his direction the society has published a whole series of research volumes, and prepared and published some of the best maps made in America; a score or more of geographers have engaged in active research in almost as many field projects; and the whole field of geography has been extended and developed as never before. In this appreciation of his work it is also just to say that he has not spared his own strength or time or resources in the task, but has labored as patiently and energetically as any of the men he has directed and inspired.

The New World is one of the finest fruits of his labors. With the resources of the Society library and work room at his elbow, meeting in his offices there the explorers, the map-makers, the field workers, the geographers of the world, culling out from the great mass of data accumulating about him the essential and significant facts that constitute the background of world affairs and world politics, he has been able to interpret the phenomena of world relationships as they exist today, as no one else can.

Isaiah Bowman has made *The New World* indispensable to every American who sincerely wishes to understand the political problems which as a citizen of the foremost democracy of the world he must play his individual part in solving. Every American citizen who would vote intelligently should read this book. Every foreigner who would understand the political situation of the world in this decade, and particularly the place of the United States in world affairs should also read this book. If both were to do so, the cause of international understanding and amity would be promoted farther than by all the peace treaties being negotiated, valuable as they are.

As Director Bowman so frankly points out in his preface, "Our economic and political problems embrace a region whose extent is beyond the Arctic Circle in Alaska, southward to Samoa, and east and west from China and the Philippines to Liberia and Tangier. If our territorial holdings are not so widely distributed as those of Great Britain, our total economic power and commercial relations are no less extensive.

"To face the problems of the day, the men who compose the government of the United States need more than native common sense and the desire to deal fairly with others. They need, above all, to give scholarly consideration to the geographical and historical materials that go into the making of that web of fact, relationship, and tradition that we call foreign policy. As we have not a trained and permanent foreign-office staff, our administrative principles are still antiquated. Thus even the loftiest intentions are too often defeated. To elevate the standards of government there is required a continuous examination of contemporary problems by citizens outside of the government service. In this way new points of view are set up and independent judgments made available."

Few who read this excellent book or use it for reference will appreciate the value of the wealth of maps with which it is illustrated. The making of maps is in itself a time-consuming, laborious, and expensive process, and their engraving and printing costs a considerable fortune. Yet in this one volume are 257 maps, nearly all original, a few modified and improved from others, truly a real bonanza for the geographer. The paper, the type, the binding, and the whole typographic ensemble measure up to the high standard set by the author in the text.

W. ELMER EKBLAW.

SCHMIDT, WALTHER. *Geographie der Welthandelsguter.* Vol. I, Kraftquellen und mineralische Industriegüter; Vol. II, Pflanzliche und tierische Nahrungs- und Industriegüter. Vol. I, 115 pp., Vol. II, 127 pp. Ferdinand Hirt, Breslau, 1925.

These two small volumes deal with the geography of commercial commodities. The first volume is devoted to energy resources and to mineral raw materials of industry, the second to

vegetable and animal foodstuffs and industrial raw materials. The size is small octavo, which allows approximately three hundred words to the page. The volumes are generously equipped with charts and diagrams, most of which are incorporated in the text.

These two volumes belong to a series known as "Jedermanns Buecherei" which in English means "Everybody's Library." This one is of several successful serial publications which have long been characteristic of German publishing methods and which may be credited with no small part of the spread of popular education in that country. These volumes sell for eighty-five cents and invariably are written and edited with praiseworthy skill and expertness and with due regard to the fact that popular education must be handled with equal, if not with greater, care than that of the advanced scholar and specialist.

These two volumes are part of the section on geography. A few titles will serve the purpose of giving a general idea of the nature of this series. These titles are picked at random: "Volcanoes," "Political Geography," "Eastern Europe," "The Natural and Cultural Aspects of the Climatic Zones of the Earth." There is an additional series dealing with anthropological aspects of geography. The two divisions are under the supervision of Dr. Rudolf Reinhard, Dr. Kurt Krause, and Dr. Fritz Krause, all of the University of Leipzig. Dr. Thilenius of the University of Hamburg also collaborates in the anthropological section.

The author of the two volumes, which are here reviewed, emphasizes the fact that an organic relationship exists between all commercial commodities, that the use of energy resources and of minerals is indispensable to the modern exploitation and utilization of animal and vegetable products and that, vice versa, the first-named group could not play its part without the supply of foodstuffs and organic raw materials being assured. Beside this basic interdependence, there are found innumerable cross currents of cause and effect of a more secondary nature.

The effort toward clearly bringing out the interaction of various natural and economic phenomena goes further. It is directed toward exposing the manifold ways in which trade affects production, industry affects trade, demand reacts on supply, and vice versa. In the geographical part, the author avoids the one-sided emphasis on climatic conditions which frequently disturbs the balance of economic geographies. He pays equal attention to questions of morphological geology, and to such anthropo-geographical influences as population density, distribution of population, etc.

Probably the best way to give an idea of the nature of the treatment is to translate the table of contents of the two volumes:

I. Energy Resources
  1. Coal and petroleum
    (a) The relationship of the geography of energy resources to the distribution of political power
    (b) Geological laws
    (c) England and the United States
    (d) Continental Europe
    (e) Future sources of energy
  2. Solar energy, wind, and water power
II. Mineral raw materials of industry
  1. Iron and the iron and steel industry
    (a) Geographical influences on the world iron economy
    (b) Industrial leaders of the earth: the United States, England, and Germany
    (c) Present iron ore supplies
    (d) Future prospects of world iron and steel production
  2. Gold and silver
  3. Copper and the copper industry
  4. Aluminum and the aluminum industry
  5. Zinc, lead, tin, nickel, and mercury
  6. Potash and the chemical industry
III. Foodstuffs, condiments, etc.
  1. Cereals
    (a) Wheat
    (b) Rye, oats, and barley
    (c) Corn, rice, and millet
    (d) Summary
  2. Potatoes
  3. Beet and cane sugar
  4. Coffee, tea, and cocoa
  5. Tobacco
  6. Fisheries
  7. Animal husbandry
IV. Vegetable and animal raw materials of industry
  1. Fibers and the textile industry
    (a) Locational factors in the wool and cotton industries
    (b) Wool
    (c) Cotton
    (d) Jute and silk
  2. Rubber and the rubber industry
  3. Forestry, fur bearing animals, wood and wood using industries

This is followed by a list of references covering altogether eighty-three items. With few exceptions the references cover German sources. From foreign literature only a few standard works, such as the Stateman's Year Book, the Agriculture Year Book, and Chisholm's Handbook of Commercial Geography, have been used.

By the most careful examination it is possible to pick out certain flaws, but the flaws that the reviewer has been able to discover are of minor importance and are of such a nature that they would seem practically unavoidable in a work designed in short space to cover a large field. On the whole the two volumes must be considered a remarkable achievement in the field of popular education.

ERICH W. ZIMMERMANN.

CLELAND, HERDMAN FITZGERALD. *Our Prehistoric Ancestors.* xvi and 379 pp.; illus., map, and bibliography. Coward-McCann, Inc., New York, 1928.

Whenever Professor Cleland engages upon a new task that task is sure to be well finished. His *Geology, Physical and Historical,* issued in 1916, immediately became one of the standard texts in the colleges and universities of the land as well as the most readable and interesting reference on the subject that the home library could obtain, and this eminent position it has retained ever since because of the nice balance and clear-cut picture it presented. Just as readable, just as interesting, just as accurate and authentic as this earlier book

of his, is *Our Prehistoric Ancestors*, which, I venture to predict, will become equally as popular. Scientifically organized, skillfully presented, and richly illustrated, the facts of man's rise from brutehood to brotherhood are made to stand out upon the dim background of his early environment in cameo relief. It is another work well done.

Professor Cleland in his preface to the book states that "the purpose of this book is to describe as briefly as clarity will permit, the events in man's prehistory which have been of greatest significance in his progress toward civilisation. All civilised peoples owe much the same debt to the men of the Stone Ages. In their upward climb all passed through these stages, but when metals came in use the cultures of different regions diverged. . . .

"The Neolithic or New Stone Age is stressed because in it man made the great fundamental inventions, compared with which the greatest achievements of today though more spectacular, are relatively unimportant. Greater changes in man's physical well-being and mental attitude took place in this age than in all preceding and subsequent ages."

The subject matter of "Our Prehistoric Ancestors" is organized in ten chapters as follows:

I. The Contributions of the Men of the Old Stone Age
II. The Epipaleolithic
III. The Neolithic or New Stone Age
IV. The Remarkable Neolithic Civilisation of Scandinavia
V. The Pile Dwellers
VI. Megalithic Monuments
VII. The Bronze Age
VIII. The Hallstatt—First Age of Iron
IX. The La Tene Epoch—The Second Age of Iron
X. In Retrospect

A comprehensive bibliography, a good glossary, and an exhaustive index conclude the book.

The high quality of Professor Cleland's work is maintained in the printer's and binder's handicraft in the book itself. Printed on white paper of the highest grade, in type as clear as a child's primer, and bound substantially and attractively in red cloth, the book will grace any library. The illustrations and maps are as clear and attractive as the text. There is not one item of craftsmanship either of author or printer that deserves unfavorable comment.

W. ELMER EKBLAW.

MILLER, GEORGE J., and PARKINS, ALMON E. *Geography of North America*. xiv and 605 pp.; maps, diagrams, illustrations, selected list of reference material, index. John Wiley and Sons, Inc., New York, 1928. 9 x 6 inches. $4.50.

The *Geography of North America* is a desirable and valuable contribution to geographic literature. It is a text distinctly unique in that it is an attempt to professionalize subject matter. The subject is treated as a cause and effect study.

In the preface the authors disarm criticism in regard to organization by stating that in order to accomplish their purpose they have violated the usual uniformity of treatment.

The general plan of the book is that of treatment, region by region. The first two chapters are given over to a discussion of North America and deals respectively with "North America as a Home for Man" and "The Climate of North America," while the third chapter treats "The United States as a National Unit." Chapters IV to VII, inclusive, are devoted to the Northeastern States. "Physiography," "Development of Agriculture," "Manufacturing," and "Fishing" are treated respectively in the four chapters. In the interactions between humanity and environment, the evolutionary tendencies and historic developments are faithfully recorded. Chapters VIII to XIII, inclusive, are devoted to the North Central Section. "An Inland Empire," "Agriculture," "The Industrial Lower Lake Region," "The Upper Lake Region," and "Unit Areas in the North Central Section" are treated respectively in the five chapters. In order to minimize material, the authors have used type studies freely, but yet very effectively. Chapters XIII to XV, inclusive, are devoted to the South. The chapter headings for the three chapters are, respectively, "The Physiographic Regions of the South," "Agriculture in the South," and "Manufacturing in the South." Chapters XVI to XX are devoted to the West. The chapter headings for the five chapters are, respectively, "The Physiographic Regions," "Climate," "Agriculture," "Livestock Industry," and "Manufacturing and Mining." Here for the first time in the book the authors mention plant geography as such. Its inclusion in other chapters would have been helpful. The livestock industry is inadequately treated to say the least. Chapter XXI is devoted to Alaska. Chapters XXII to XXVII, inclusive, are devoted to the study of Canada and Newfoundland. "Major Features of the Natural Environment," "The Canadian People and Their Principal Industries, "The Maritime Provinces and Newfoundland," "The Great Lakes-St. Lawrence Region," "The Prairie Plains and Arctic Meadows," and "The Pacific Mountain Region" are discussed respectively in the six chapters. Chapters XXVIII and XXIX are devoted to Mexico, while the last chapters treat the geographic considerations of Middle America.

The avowed object of the book is to make clear all relationships that exist between man and his environment and the writers never lose sight of this object. There is no mere cataloging of facts, but an orderly arrangement of material so that each paragraph is a challenge to the intellect of the earnest student. The style is vigorous and picturesque and there is a clear exposition of all geographic principles involved.

A characteristic of the whole book is the inclusion of a large number of small maps, graphs, and illustrations. Suggestions to students and teach-

ers in the fore part of the book and the questions, exercises, and problems at the end of each chapter are desirable items to those not fully equipped with teaching technique.

The book is a scholarly work and one that all interested in general regional studies of North America may consult with profit.

FLOYD F. CUNNINGHAM.

MUSIL, ALOIS. *The Middle Euphrates.* A Topographical Itinerary. American Geographical Society, Oriental Explorations and Studies No. 3. In 2 parts. Maps; ills.; bibliography; index. 426 pp. New York, 1927.

In this, the third of the series, *American Geographical Society, Oriental Explorations and Studies*, Alois Musil continues his account of eight years' topographical journeyings in Arabia and Mesopotamia. *The Middle Euphrates* is concerned with two journeys, one taken in the spring of 1912, the other in the spring of 1915. The route of the first begins at Dejr az-Zôr on the Euphrates and follows the right bank of the river south to an-Neǧef, thence turns north to Bagdad by way of Babylon, then northward to Sâmarra, and along the Tigris to Tekrît. From there the route crosses the divide between the two rivers, reaching the Euphrates at Râwa. Northwestward to al-Ḫâbûr, thence northwestward and westward to ar-Raḳḳa and Abu Hrêra complete this journey. The starting point of the second is al-Ḥîra, south of the Euphrates in about the longitude of Bagdad. For some distance it follows the river northward. Then it turns directly east to Bagdad, whence it makes a long, northwest loop past the salina of Umm Raḥal, then back to the Euphrates, following the left bank northward. At Dejr az-Zôr it crosses to the right bank and follows this to the end of the journey, beyond Abu Hrêra.

Meticulous care in the notation of every topographical detail and in ascertaining every possible name make book and maps of value to the geographer. Copious footnotes of historical nature identify the many piles of ruins and correlate the old names and the new. The very full appendixes go further into the history and archaeology of the region, giving summaries of ancient records from Assyrian, Greek, and Arab. It is veritably a bookful of facts, for geographer, historian, archaeologist. But, for the general reader, the book is a bewildering array of times, place-names, and directions.

Through it all, one gathers vaguely the idea of a journey, perhaps not exactly lonely, but not all safety and pleasantness, over a monotonous, inhospitable land, where the wells are salt, bitter, or filled with locusts, where the next tribe may plunder if this one does not, and where mounds of ancient ruins are more frequently passed than inhabited towns. Such is the little-known, arid land of Mesopotamia.

PRISCILLA H. WEBSTER.

HENDERSON, KEITH. *Prehistoric Man.* vii and 267 pp.; maps and illus. E. P. Dutton and Co., New York, 1927. $3.00.

The growing interest in man's prehistory is indicated by the number of new books being issued on the subject. Among these, Keith Henderson's *Prehistoric Man* will surely take a prominent place, for it is well written, interesting, and unusually comprehensive. The method of handling the wealth of subject matter at his disposal is best described in his own words:

"For you who might hesitate to sit down before a solid spread of all the rather indigestible facts, it is proposed that we should set forth, accompanied by a group of eminent professors, upon a sort of picnic tour, starting at some godless hour before the dawn of humanity and observing at ease during the vast journey until gradually, now on this side, now on that, the first landmarks of history begin to appear on the horizon. There shall be no long halts—so essential in more prolonged studies—for the proving of each successive point by measurements in millimetres of sigmoid notches, mylohyoid grooves and such. Evidence in plenty for most of the statements made will be found in the books referred to at the end. For the rest, my own unpretentious notions have been so hedged about with the blessed words probably, possibly and perhaps, that no one need be led astray, either, for instance, about the antiquity of dancing; or about the effect of a too long lack of certain vitamins on the health of naturally herbivorous creatures like the Mousterians; or about the original Mediterranean homelands; or about the corridor-barrows and how they may be no more than a mere lengthening out of the earliest dolmen-barrows. . . ."

The book is divided into two parts. The first begins with the ordinary geologic time table, to which is added an expansion of the "Age of Man." This first part then continues by brief illuminated steps from the Eocene lemur-sprites who, probably, first began to show the glimmerings of what we call intelligence, up by the monkeys, the great apes, the ape-creatures in Java, the more man-like creatures of the Piltdown, Heidelberg, Neanderthal or Mousterian periods, the pony-hunters at Solutre, the mammoth hunters at Predmost, the Magdalenian artists, the Spanish Capsians, and the Azilian crabeaters to the proper or real, but still primitive, men of the Neolithic.

Each period leading up to the Neolithic is discussed—the Chellean, the Acheulean, the Mousterian, the Aurignacian, the Solutrean, the Magdalenian, and the Azilian. The author's style is well illustrated by the closing paragraphs of Part I: The end of the Azilian Age has come, and we must move on. An age only half conscious, a hesitating age of small beginnings. Small people, small flint weapons, small painted pebbles. And the last thing the professors,

finishing their researches for the moment, have to show is small too—a field mouse!

"No, not quite the last thing. Look, before this frail body is turned to stone. Listen, before the ravenous earth swallows it up—a small, sweet sound, the sound of a thrush singing."

It is however in Part II that the author is happiest. In discussing the Neolithic beginnings he takes great delight in painting sharp pictures of the lives of the first "real" men, their villages, their homes, their clothing, their way of doing things. He continues his happy development of this theme through the copper age in Babylonia, Egypt, and Baluchistan, the story of the tribes that talk "Aryan," and the Bronze age in Crete, China, and the uttermost frontiers of the world then. He concludes the book with accounts of the Iron Age with its stalwart hordes of war-waging soldiery from Rome reaping the golden harvests of Casivellaunus's Keltish people of the Kentish coast of Britain, and the ravaging Nordic pirates under the fair-haired Nordic chieftains setting up their runestones as far as the chill coasts of Iceland.

W. ELMER EKBLAW.

PARTSCH, JOSEPH. *Geographie des Welthandels.* Edited by Rudolf Reinhard. 358 pp. Ferdinand Hirt, Breslau, 1927.

Joseph Partsch is well-known among American geographers through his excellent contributions to the literature in the field. Possibly, he is still better known as the successor to Ratzel at the University of Leipzig. Partsch taught economic geography both at that university and at the Handelshochschule of Leipzig.

This volume dealing with the geography of world commerce is the outcome of these lectures. It was written at the urgent request of the author's many pupils and disciples. Partsch died after he had completed the first draft of the first two parts. The third part, which was to have covered the subject of trade routes and trade centers, was never completed.

As a geographer, Partsch is eager to give a purely geographical presentation of the subject of economic geography. For that reason he divides the field of commercial commodities into several major groups, according to the great climatic belts of the earth. To be sure, such a division lends itself well to bringing out clearly the basic facts of geographical influences on production. On the other hand this division has decided draw-backs. The geography of wheat production can hardly be explained by a one-sided emphasis on climatic influences and a corresponding neglect of economic and political considerations. It seems strange to find the production of Indian wheat treated under the heading of "Temperate Zone Products," the production of Egyptian cotton under "Monsoon Climate," etc. Likewise the distribution of domesticated animals can be explained probably better through an historical account of their artificial acclimatization than by means of the climatological approach. This latter suggestion should not give the impression that the author neglects the historical aspects of his subject. As a matter of fact, the tracing of ever-changing forms of the interactions between man and environment through the course of human history was one of the hobbies of Partsch.

The first part, which covers seventy-four pages, discusses man as the subject of trade. An interesting account is given of the distribution of population, of racial divisions, of the relative importance of languages, of religions, and, finally, of the division of political power.

The second part covers four-fifths of the entire volume and is devoted to a discussion of the most important commodities of world commerce. This part corresponds, in general, with what one would expect to find in a text book on economic geography, except that, throughout, the emphasis is on world commerce. The material is thoroughly up to date and presented in a very interesting and readable style.

If the reviewer has any criticism to offer, it has to do with the relative emphasis which the author has placed upon various groups of commodities. The bulk of the discussion is devoted to vegetable and animal products. Particularly, the products of the ocean are given far more than customary attention. If the relative significance of commodities or commodity groups is to be measured by the pecuniary value which they possess, such an overemphasis seems to be regrettable. The same criticism applies to the small space given to minerals. While organic substances still furnish the basic necessities of life, yet the minerals place the characteristic stamp upon modern economic life. If their distribution is geologically rather than geographically explained, that fact should not mislead the geographer into a distribution of emphasis which is dictated by his subjective attitude towards the material rather than by the actual importance of each phase, objectively considered. It is furthermore to be regretted that manufacturing industry has to be satisfied with only ten pages—if we disregard a few scattered remarks on various industries which are made in connection with the discussion of their raw materials.

In spite of these apparent defects this splendid work deserves the careful consideration of American geographers. Throughout its pages the book reveals a highly cultured mind and an unusual knowledge of geographical facts and relationships such as only the best authorities possess. The numerous references to literature should also prove valuable to the reader.

ERICH W. ZIMMERMANN.

SWANSON, C. O. *Wheat Flour and Diet.* Illustrations and index. Macmillan Co., 1928. 197 pp.

In order that erroneous ideas with respect to wheat flour and its place in the diet be rectified, Dr.

C. O. Swanson, head of the Department of Milling, Kansas State Agricultural College, has discussed interestingly and convincingly the status of this food which composes one-third of the total food of the people of the United States. The text is designed primarily for the layman; however, the specialists in geography, economics, foods, and nutrition will find much of unusual value in their respective fields. The economic geographer, in particular, will be pleased with the pertinent treatment of wheat flour production and consumption.

The first four chapters deal successively with the history of the use of wheat flour, its comparative importance as a food, efficiency in relation to its production, and the important wheats which are utilized in the making of flour. These major topics yield an excellent survey of an agricultural industry. The author stresses the adaptability of arid regions to wheat production in the earliest times. Statistics of present-day production for the world, continents, countries, and states, 1920–1925, show clearly the preeminence of the intermediate regions of the world as wheat producers. Pre-harvest factors, climate, soil, and variety are discussed in relation to the wheats used in making flour, but lend themselves nicely to a regional distribution of the various wheat-producing areas in the United States. Storage and marketing stages are also considered.

"Wheat production as measured by human labor is very efficient. Careful agricultural surveys have established that on the average, under fairly efficient methods of wheat production, each bushel of wheat represents 30 minutes of man labor . . . 2.5 hours of man labor efficiently spent in wheat raising produces one-third of the raw material for the total energy food consumed by an average adult person per year . . . if all raw materials for food could be produced as efficiently as wheat, 7.5 hours of man labor would produce this raw material required for one adult in one year." Other statements equally significant elucidate the economics of wheat production.

There has been a decrease of 20 per cent (one bushel) in per capita wheat consumption in the United States in the last twenty years, due largely to increased purchasing power of the people. The author reviews carefully the various phases of this problem. In spite of the diminution in per capita consumption the total amount will increase because of increasing population.

Chapters V, VI, VII, VIII, and IX are devoted to the milling industry: its development, preparation of wheat for milling into flour, the modern process of milling flour, some reasons for milling, and the cost of milling to the consumer. The simple yet adequate manner of presentation makes the extremely complex milling industry seem within the grasp of all. Appropriate illustrations and diagrams facilitate a definite understanding of processes.

In the last six chapters of the book, wheat flour is evaluated as a food and viewed from a dietetic standpoint. These pages are well worth reading. One concludes: what was true in the time of the ancients is equally effective today—man dislikes a one-sided diet, and it is well that he should.

J. HERBERT BURGY.

HOSKINS, HALFORD LANCASTER. *British Routes to India.* xviii and 480 pp., maps, illustrations, bibliography, and index. Longmans, Green and Co., New York, 1928. 9 x 6 inches. $7.50.

"The Suez Canal or second Bosphorus is undoubtedly the most important of the world's waterways . . . concern for this highway is the key to British foreign policy."—*Hoskins*

British Sea Routes To India is a book that ranks well with the most carefully prepared treatises on the Mediterranean-Levantine-Indian regions, the "Highway of Empire."

Hoskins is an historian, but his scholarly synthesis of the means by which England was slowly brought to the realization of the paramount need of a direct route to India is predicated on such a sound and scientific knowledge of the geography of the Near East that his contribution is of great value to the professional geographer. He has not written a textbook, but the political geographer would do well in placing this volume among the four or five best discussions of the Egyptian Artery.

The various chapter headings suggest at once the richness of geographical content—"Beginnings of English Interest in Egypt," "International Competition for the Overland Route," "Steam and the All-Sea Route to India," "Tentative Trials of the Suez Passage," "Shaping of a British Eastern Policy," "Attempts to Open the Euphrates Route," "Paving the Way to India," "Establishment of the Overland Route," "Beginnings of the Suez Canal," "Telegraphic Routes to the East," "Revival of Projects for an Alternative Route (The Bagdadbahn)," "The Canal and the Control of Egypt."

His opening chapter traces in a most interesting manner the classical story of England's late entrance into the colonizing world, her groping reach into the Indian treasure region, where after conflict with commercial rival and pirate, she establishes the first phase of "pax Britannia." British ships had traded in the Mediterranean, but British sea-power preferred an all-sea route, which could be kept open, to an over-land route held by the impossible Turk. As long as the Porte held control over Asia Minor, England was little interested in the Mediterranean Route, but a revolt in Egypt in 1766, followed by the expression of interest in the possibility of that route by Austria and France, resulted in the reawakening of British concern over the state of affairs in the Nile Region. While Turkey on the one hand and Austria and Russia on the other were engaged in a succession of wars, France and England as

neutrals began to focus their eyes a little more closely on Egyptian affairs. France believed that the partition of the Ottoman Empire was at hand, and that she might compensate herself for losses in India by seizing Egypt. England had experienced the super-attractiveness of owning a route that had enabled her to "convey in a period of sixty-eight days, the first advices of the war, by means of which they were enabled, to the astonishment of all England, when the news arrived, to expel the French from India before succours could reach them, and add their possession to our own."

In spite, however, of the geographical significance of the Suez Route, political conditions were such in Turkey that England, thanks to the influence of her insular environment, monopolized the Cape of Good Hope Route from 1600 until the later part of the nineteenth century—a period of approximately two hundred years.

"International Competition for the Overland Route," the second chapter, is a beautiful development of the manner in which geographical location operates in history. Turkey with its intercontinental location lies at the cross-roads of the Mediterranean-Red Sea trade routes. Her vicinal location with relation to northwestern Europe and India, causes her to become the pawn of every continental Power.

Russia "was thereby made the keener for further acquisitions which might lead to the much-coveted seaport on the Mediterranean." France knew that once in possession of Egypt she would "possess the master-key to all trading nations of the earth. Enlightened as the times are, in general arts of navigation and commerce, she might make it the 'awe' of the eastern world . . . England would hold her possessions in India at the mercy of France!" France did not mince words when these suggestions appeared, "Toulon on the 20th of June, . . . Alexandria on the 10th of July, . . . Cairo about the 20th, at Suez about the 25th, forty-five days later in India, before the English would have had time to take any defensive measure. Ten thousand French newly arrived . . . a single campaign, . . . would chase them out entirely from Bengal . . ."

Austria, in order to establish influence at the Porte "loaded the [chief of customs at Alexandria] with honors and titles."

Finally England awakened by the revival of activities in the Levant attempted to secure by "proper and discrete means" favored nation treaties with Constantinople. Such a treaty was secured in 1794, not from the Porte to be sure, but from the Bey of Egypt. England now directed her policy so as to secure control of the key-highway, or failing in this, to prevent France from becoming "entrenched at Suez" which act might enable them to "throw down the colossus which the English have raised in Bengal."

Steam and the All-Sea Route to India now came to the forefront. The dangers of the Cape of Good Hope Route were many; in addition to a water passage of approximately four months, even on the fast and famous "East Indiamen," the time spent in the tropical seas was exceptionally trying. To avoid or at least to shorten such a trip which incurred so many unpleasant phases, a combination steam-sailing vessel left England in August, 1825, and made the trip in 113 days. The vessel ran out of fuel, but the sail arrangement allowed it to complete its voyage successfully. March 20, 1830, a steamer left Bombay and reached Suez a month later after an entirely successful passage. This remarkable voyage through the uncharted channel of the Red Sea signified the beginning of the end of the Cape route; from now on activities were to concentrate on the short cut to the Mediterranean.

Paving the way to India made England face with a hitherfore unprecedented intensity, the scientific consideration of means of approach to the gateway. Gibraltar was already in British possession, Malta and the Ionian Isles were soon obtained so that the western passage through the Mediterranean was secured; preparations for the solidification of the eastern approaches were then developed—triangulations had been made in the Red Sea in 1830, Socratra had been viewed and its strategic position noted, Aden had loomed up as the only real port of call between Bombay and Suez, where in its "commodious, well protected harbor, its natural advantages, the ease with which it could be fortified, the quantity and the excellence of the fresh water supply, made it perhaps the most promising location for a steam supply base." The "timely incident" occurred and Aden was added to British coaling stations in the Indian Ocean. Kurruchee, relatively near the entrance to the Persian Gulf, had become a British sphere of influence. Perim Island was surveyed and declared "too barren" but it was still British. Mocha and Jedda were of interest to the British but "not useful."

A secret survey of the Euphrates had been made by an English traveller who "when he thought himself unobserved, thrust a long pole, through the interstices of this raft, at intervals, and thus determined the approximate depth of the water."

The building of the Suez Canal was opposed by the British. They had already secured the right to construct a railway across the isthmus, and they felt that there was too great a danger in allowing France to "entrench itself there." The political chaos in Egypt was such that no European power knew exactly where it stood. None of the Big Four—England, France, Russia and Austria—liked the Turk, but they liked each other less. Turkey was a tournament field for diplomatics. England openly favored Turkey but she unknowingly, at least officially, sold ammunition to Russia who was ever desirous of quartering the Porte. Turkey could not complain, her inherent hatred for the Christian increased by leaps and bounds, but she held a strategic position and she knew that the Euro-

peans could not afford to dislodge her from that position—exactly what happened at the end of the World War. Therefore, she very craftily made use of the so-called balance of power scheme, by which she obtained much and gave little in return.

However, French diplomacy was in the lead for the time being, and in 1860 the Suez Canal was started. The English opposed it from the very outset, first, because it "is physically impossible, except at a cost which must put out of all question its being profitable as a commercial speculation and must therefore prove . . . it can be undertaken only for political objects;" second, it would delay the completion of the English-built rail line, would injure interests in India, and it might prevent free and rapid passage of English goods; and third, "it is founded upon an antagonistic policy on the part of France. . . ."

When it became evident that opposition to the canal was useless, England soon discovered that it was but an essential link in her chain of island coaling stations to India, and thereafter bent all efforts toward securing control by "proper and discrete means." "The first vessel to pass through the canal and pay tolls in regular course flew the British flag. And it was presently found that, over the course of the first few years, practically 75 per cent of the vessels passing through the canal were British. From the beginning the canal was none the less British highway because it had been constructed and was being operated by a corporation which was essentially French." The purchase of a large share of the stock in the Company by the British Government merely indicated the geographical foresight of English diplomats like Disraeli.

Telegraphic routes to the East emphasize at once the tremendous increase in speed with which messages are sent around the world at present, and stresses very clearly indeed that the strategic value of the Suez passageway increases with the use of cable and telegraphic lines.

In 1876 a message to Egypt required 3 or 4 hours; in 1900 it required but 20 minutes, and 100 minutes to Australia; but in 1924 a message despatched by King George encircled the world over British lines and was received at the starting point eighty seconds later.

Britain could not afford to depend on lines passing through territory under foreign control; therefore, the logical route to India was again by way of the Suez Canal—the wisdom of such a move was clearly proven during the World War.

The revival of projects as to the development of additional routes to the East brought into being what appeared to the English as the monstrous *Bagdadbahn*—a scheme by which Germany hoped to offset her belated arrival into world affairs by securing a place in the Indian sun. Diplomacy had accomplished its task in securing the option for the rail line, but Europe became involved in the great turmoil and the Berlin-Bagdad Railroad remains to be completed—only this time the Bagdad section will be completed by the British, and will make connections with its own "point de depart", and "place d'armes" the island of Cyprus.

It is interesting to note how small a part the United States played in the struggle for the Suez Route. Geographical remoteness, together with a vast internal domain crying for development, prevented the Americans from entering into the negotiations for control of the Red Sea Route. Surely American diplomats were not unaware that a great tourney was being staged in Europe, but they were powerless to do anything more than to sit as interested spectators—America was too far away.

Dr. Hoskins' account of the Levantine routes to India will appeal to a wide circle of readers. He has not attempted to eulogize British diplomatic methods; he has created a synthesis in which he stresses the geographic factors so unconspicuously that they add to and vivify a major historical episode, and in which he proves very definitely, indeed, that in order to interpret a series of historical events, one should, and must have, a firm geographic foundation.

ALBERT LAFLEUR.

ANNOUNCEMENT

THE series of articles, *Agricultural Regions of the World*, is continued in this issue with the seventh instalment of *Agricultural Regions of North America*, by Dr. O. E. Baker of the United States Bureau of Agricultural Economics, presenting the latest and most authentic data available on North American agriculture. The next instalment of *Agricultural Regions of North America* will appear in the April issue.

Dr. Clarence F. Jones has recently returned from South America after having assembled authoritative data, and studied conditions in the field, for the completion of his series on the *Agricultural Regions of South America*. His series will soon be resumed.

Agricultural Regions of Africa, by Homer L. Shantz of the University of Illinois and president-elect of the University of Arizona; *of Australia*, by Griffith Taylor of the University of Sidney, one of the foremost geographers of the world; and *of Asia*, by Olof Jonasson of the University of Commerce of Stockholm will follow in later issues to complete the finest geographic discussion of the world's agriculture thus far published.

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Fisheries of the South Atlantic and Gulf States, J. H. Matthews, Atlantic Coast Fisheries Company.
The Iron and Steel Industry of the Birmingham, Alabama, District, Langdon White, Randolph-Macon Women's College.
America's Resources in Nitrogen, Potash and Phosphorus, Guy E. Mitchell, U. S. Geological Survey.
Possibilities of Rubber Production in Caribbean America, Jewell Venter, University of Missouri.
The Kentucky Geographical Surveys: A Review, W. Elmer Ekblaw, Clark University.
Agricultural Regions of North America, Oliver E. Baker, U. S. Dept. of Agriculture.

July includes:

The Civilizing Rails, Mark Jefferson, State Normal School, Ypsilanti, Michigan.
Piedmont North Carolina and Textile Production, Jefferson Bynum, University of North Carolina.
Location Factors in the Iron and Steel Industry, Richard Hartshorne, University of Minnesota.
The Ozark Orchard Center of Southern Illinois, Ina C. Robertson, State Teachers College, Valley City, North Dakota.
Agricultural Regions of South America, Clarence M. Jones, Clark University.
Egypt is the Nile, Paul F. Gemmill, University of Pennsylvania.

April includes:

Iron and Steel Industry of the Pittsburgh District, Langdon White, Miami University.
European Forests and Their Utilization, Bruno F. A. Dietrich, University of Breslau.
Agricultural Regions of South America, Clarence F. Jones, Clark University.
Localization of the Cotton Industry in Lancashire, England, Rollin S. Atwood, Clark University.
New York Barge Canal—Expectations and Realizations, Florence Whitbeck, University of Rochester.

January includes:

Agricultural Regions of South America, Clarence F. Jones, Clark University.
The Red Land of Gwent in Eastern Monmouthshire, E. Muriel Poggi, University of Illinois.
Agricultural Regions of North America, Oliver E. Baker, U. S. Dept. of Agriculture.
Cotton Manufacturing—North and South, Robert M. Brown, Rhode Island College of Education.
Distribution of Crops in Peru, Harley P. Milstead, Montclair College of Education.

The October issue of Volume 3 contains the following articles:

The United States and Its Chief Competitors in South American Trade, Clarence F. Jones, Clark University.
A Nation's Water Power, Herman Stabler, U. S. Geological Survey.
Agricultural Regions of North America, Oliver E. Baker, U. S. Dept. of Agriculture.
Relation of Taurine Cattle to Climate, Fred A. Davidson, University of Illinois.
The Michigan Sugar Beet Industry, F. A. Stilgenbauer, College of the City of Detroit.
The Cotton Industry of Peru, Arthur H. Rosenfeld, Tropical Plant Research Foundation, and Clarence F. Jones, Clark University.

July includes:

Dairying Industry of New Zealand, Horace Belshaw, Auckland University College, New Zealand.
Agricultural Production in China, Albert La Fleur and Edwin J. Foscue, Clark University.
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Agricultural Conditions in Florida in 1925, Roland M. Harper, Florida Geological Survey.
Bolivia as a Source of Tin, Harley P. Milstead, Montclair State Normal School.
The Trade of Uruguay, Clarence F. Jones, Clark University.
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Minneapolis, the Mill City, Daniel R. Bergsmark, University of Chicago.

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